THE
POPULAR SCIENCE
MONTHLY.

DECEMBER, 1910

THE ILONGOT OR IBILAO OF LUZON

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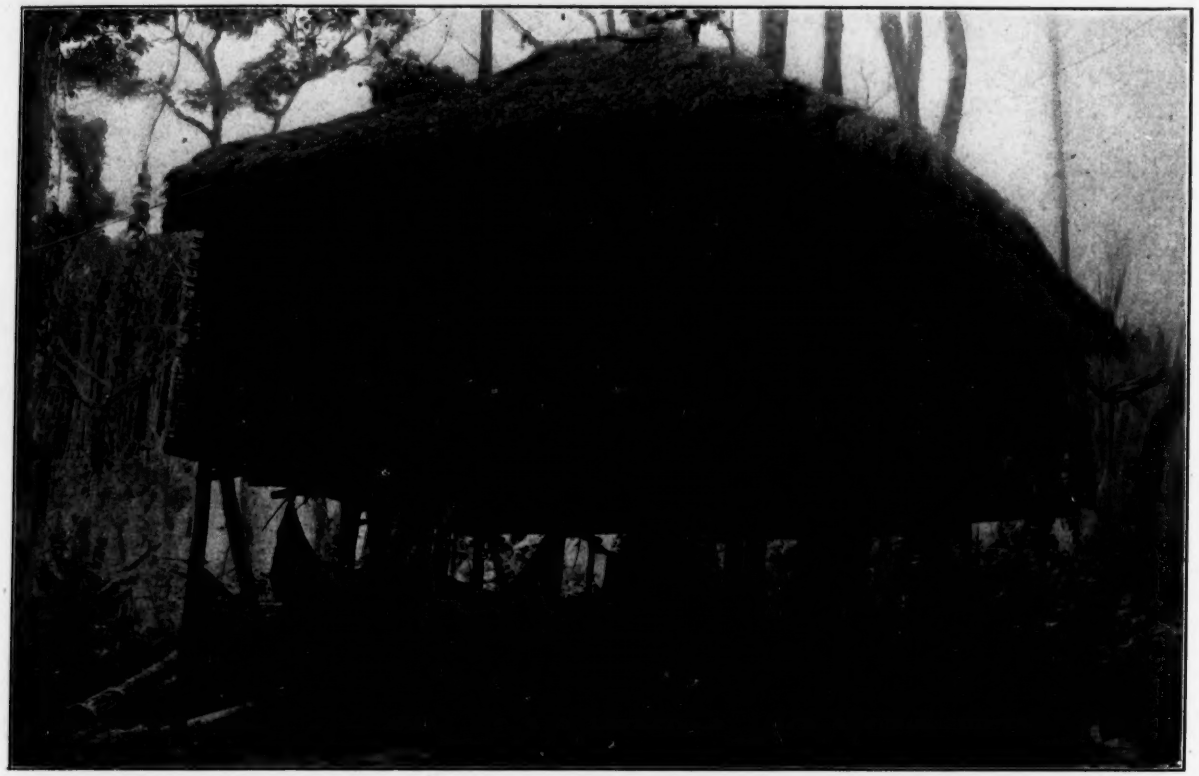
THE grewsome practise of taking human heads is particularly associated with the Igorot peoples of the Cordillera of Luzon. These all engage in it or have done so until recently. But to-day the most persistent and dreaded headhunters are neither Igorot nor inhabitants of the Cordillera; they are a wild, forest-dwelling people in the broken and almost impenetrable mountain region formed by the junction of the Sierra Madre range with the Caraballo Sur. They have been called by different names by the peoples contiguous to them on the north, west and south, "Italon," "Ibilao," "Ilongot" or "Ilūngūt." The last designation would for some reasons be the preferred, but "Ibilao," or as it is quite commonly pronounced locally through northern Nueva Ecija, "Abilao," has perhaps the widest use.[1]

There are no early records of these people and until late in his rule the Spaniard knew almost nothing of them. In the latter half of the eighteenth century, the valley of the Magat was occupied and the mission of Ituy founded, out of which came the province of Nueva Vizcaya, with its converted population of Gaddang and Isinay. To reach Ituy from the south the trail followed up the valley of the Rio Pampanga almost to its sources and then climbed over the Caraballo Sur to the headwaters of the Magat. On this trail along the upper waters of the Pampanga grew up several small mission stations, Pantabangan and Karanglan, with a population of Pampanga and Tagalog people drawn from the provinces to the south. After more than a hundred years these small towns are still almost the only Christian settlements in

[1] The report of these people under different names has been the cause of the belief that they were so many separate peoples. Professor F. Blumentritt makes this mistake. "Versuch einer Ethnographie der Philippinen," p. 33; "List of Native Tribes of the Philippines," translated in Smithsonian Report for 1899.



AN ILONGOT AT OYAO, NUEVA VIZCAYA.

Photograph taken in 1904. Tobacco is drying underneath the house. Behind the house stand the bare trees of the forest clearing.

northern Nueva Ecija. From the time of their establishment we find references to the "Ilongotes" who inhabited the mountains to the east and were spoken of as "savages," "treacherous murderers," "cannibals," and wholly untamable. Much as described a hundred years ago they have continued to the present day. Their homes are in thick mountain jungle where it is difficult to follow them, but, from time to time they steal out of the forests to fall upon the wayfarer or resident of the valley and leave him a beheaded and dismembered corpse.

Here are a few instances occurring in recent years which came under my own notice or investigation. In 1902, the presidente of Bambang, Nueva Vizcaya, informed me that four women had been killed while fishing a short distance from the town. In March of the same year, a party of Ilongot crossed the upper part of Nueva Ecija and in a barrio of San Quentin, Pangasinan, killed five people and took the heads of four. In November, 1901, near the barrio of Kita Kita, Nueva Ecija, an old man and two boys were killed, while a little earlier two men were attacked on the road above Karanglan, one killed and his head taken. In January, 1902, Mr. Thomson, the superintendent of schools, saw the bodies of two men and a woman on the road, six miles south of Karanglan, who had been killed only a few moments before. The heads of these victims had been taken and their breasts completely opened by a triangular excision, the apex at the collar bone and the lower points at the nipples, through which the heart and lungs had been removed and carried away. As late as a year ago (1909), on the trail to San José and Punkan, I saw the spot where shortly before four men were murdered by Ilongot from the "Biruk district." These men were carrying two large cans of "bino" or native distilled liquor, from which the Ilongot imbibed, with the result that three of their party were found drunk on the trail and were captured. These are only a few out of numerous instances, but they explain why the great fertile plains of northern Nueva Ecija are undeveloped and why the few inhabitants dwell uneasy and apprehensive.

There have been no successful attempts to subdue or civilize these people. Between 1883 and 1893, the missionary friar, Francisco Eloriaga, founded the Mission of Binatangan in the forested hills east of Bayombong, and the Spanish government had the project of erecting it into a "politico-military commandancia," but so far as I know did not reach the point of sending there an officer and detachment. Something was learned about the most accessible Ibilao, but no permanent results followed.[2] Since the American occupation, however, progress has been made in our knowledge and control of this people. In October, 1902, the writer, at that time chief of the Bureau of Non-Christian

[2] A brief account of the people about Binatangan was published by a missionary in 1891 in "El Correo Sino-Annamita," Vol. XXV. "Una Visita á los Rancherias de Ilongotes," by Father Buenaventura Campa.

ILONGOT HUNTING PARTY.

Photograph taken near Delapin in Nueva Vizcaya in August, The large nets carried are stretched in the jungle across the game trails and the game are driven into them. The spears and bows and arrows represent their typical weapons. The curly headed man represents the mixed Malayan and Negrito type common in these people.

Tribes, and engaged in a preliminary reconnaissance of the pagan peoples of northern Luzon, made a trip with a small party to one of their communities in the mountains east of Bambang. Photographs, measurements and notes on their language and social institutions were made. In January, 1906, Mr. Dean C. Worcester, secretary of the interior, approached these people from the north, by ascending the Kagayan river. His party started from a station of the Tabacalera Company, south of Echague, and from there rode through fine forest to a "sitio" called Masaysayasaya. From here they "started at dawn and about noon passed the 'dead line' set by the Ilongotes. A little before sundown reached Dumabato, an Ilongote and Negrito settlement, which had been the headquarters of Sibley,[3] the deserter. Here were found a few filthy Ilongotes and some fine Negritos."

In the spring of 1908, Dr. William Jones, of the Field Columbian Museum, began a residence among the Ilongot of the upper Kagayan and lived with them continuously until nearly a year had passed, when he was killed by them. His notes and specimens were fortunately preserved and, when published, should constitute the most original and important contribution ever made to Philippine ethnology. Dr. Jones was part American Indian, a member of the Sac and Fox tribe. He was not only a brilliant scientist, but one of the most engaging and interesting men I have ever known—a man to cleave to. Here are brief extracts from two letters written by him from the Ibilao country, valuable, I think, not only for the information they contain about this people, but for the light they throw upon him and his manner of work.

May 26, 1908. I am at present among the Ilongotes of the Cagayan, where I am having the most enjoyable time since my arrival in the islands. These people are wilder than the Igorrotes. We made friends at the beginning and the friendship has grown wider and stronger every succeeding day. I have a shack high up on poles where I dwell with great comfort. And plenty of food is to be had always; wild hog and venison in the jungle on either side of the river; lurong and liesas in the river; wild honey back on the mountain side; bananas, beans, camote and other things from the cultivated patches, and rice which has been saved from last season. For the last fortnight the people have been clearing in the jungle for sementeras.[4] I wish you might hear the sweet melody of the songs of boys and women at work in the clearings, songs sung to the spirits of the trees and for good crops. Ilongot society is much simpler than that of the Igorote; there is little if any of what may be called village life. There is a house here, another yonder and so on here and there along the river. Places near the river are reached by going on balsas[5] and away from the river the trails are dim and indistinct. I do not know where I shall end up. I am heading up-stream. It may be that I shall find myself going west and southwest into the country of the Ilongotes, who are enemies of the ones I am now

[3] Sibley was an American soldier from the 16th Infantry who deserted in 1900, and lived for over four years, a renegade among these people. He finally surrendered to Governor Curry, of Isabela province.

[4] Fields for seeding.

[5] Cane rafts.

ILONGOT MEN AND WOMAN OF OYAO, NUEVA VIZCAYA.
The man on the right wears a characteristic head cover of rattan, which confines his long hair.

with. I have to go much lighter than what I am now to keep up with the little black Negrito. He is like a flea; here to-day, there to-morrow, and ever on the move when food is gone, and at rest, when he has a supply, long enough to consume it. He is at outs with the particular people I am with at present.

Kagadyangan, on the Cagayan, Isabela. July, about the 12, 1908. I am compelled by force of circumstances to continue in this field for three or four months more; at least that much time must pass before I can observe a full cycle of the various activities of these people. Furthermore, the rainy season sets in about September and it is difficult ascending in this region where the rapids are numerous and swift. . . . I have come upon Ilongote habitations in cliff and rock shelters. Why might their ancestors or those of others not have lived in such in ages past and left evidences of an earlier culture? Many Ifugao burials are in sepulchres on mountain sides and the practise is no doubt very old. Places like these and those of rock shelters in other lands have given fruitful results and might they not in these islands?* I am having a pleasant time with these people. They are the wildest of any people that I have yet come across in Luzon. But like all wild people, they are cordial and hospitable. I live in their houses and so have their presence day and night. I hunt, fish and hike with them, see them on and off their guard, observe them in all their varying moods—in short, I'm very close to them all the time. Some time I will tell you a thing or two about them.

Alas, for his intimacy and confidence in them! Alas, that so gifted and lovable a man should have been lost by their treachery to science and to his friends!

From the Nueva Vizcaya side considerable progress has been made in the acquaintance and control of these people. For several years, Mr. Conner, the superintendent of schools, cultivated their friendship and gained information that led to his successor, Mr. R. J. Murphy, organizing a school in the community of Makebengat. The method followed was to hire a very trustworthy and capable Filipino of the town of Bambang who speaks their language and has had friendly relations with them, to go out and dwell with them, persuading and hiring them to build a good dwelling house for the teacher, a school house and shop, and to bring their own dwellings into the locality fixed upon for the school. Then there were sent out two native teachers (one a woman, capable of teaching spinning and loom weaving), to begin the instruction of the children in language, figuring and in industrial arts not known to the Ilongot. This school experiment promises to succeed and has already led to starting one or two other schools in communities still more distant in the forest.

Governor Bryant, of the province, has felt much interest in these people, and two years ago performed the very difficult feat of traversing the forests from these first communities northward to the province of Isabela. This hazardous exploration occupied about two weeks before

*The Ifugao are an Igorot people inhabiting the Kiangan region. All the Igorot people practise, wherever possible, the burial of their rich and important personages in caves and artificial grottos. Burial caves occur in many places in the Philippines and have yielded a large store of jars, skulls and ornaments.

the party emerged from the forest into the open country. The greatest difficulty and peril was lack of food, which can not be carried in sufficient quantities to sustain the entire journey.

In January, 1909, a very important exploration was made by Governor Bryant, escorted by Captain Hunt with a detachment of soldiers, and accompanied by Mr. Murphy and Dr. M. L. Miller, chief of the ethnological survey. The party left Dupah, January 7, and traversed the wholly unknown country lying to the southwest. The course of the wild gorge of the "Kaseknan" river, the head of the Kagayan, was developed, several important communities of Ilongot were discovered and visited without hostilities and the first knowledge obtained of much of this region. After struggling for ten days with the difficulties of jungle, ravine and densely covered mountains, the party reached Baler on the Pacific coast.

In May, 1909, the writer, accompanied by Lieutenant Coon and six native soldiers, reached a small community of Ilongot east of Pantabangan, called "Patakgao." This community seemed to be composed of renegades and outlaws from several other communities. Certainly their hand was against every man. They were charged by a small group of Ilongot living near Pantabangan with the murder of two of their number a few weeks earlier and they themselves professed to be harried and persecuted by unfriendly Ilongot to the north and east of them. They had wounds to exhibit received in a chance fray a few days before with a hunting party from near Baler. Altogether, their wayward and hazardous life was a most interesting exhibit of the anarchy and retaliation that reign in primitive Malayan communities which are totally "in want of a common judge with authority." A series of measurements was obtained by me at Patagkao and vocabulary and notes extended.

With the above remarks as to what has been accomplished in throwing light upon these people some description of them will be given. For information of their location and condition I am indebted to several others, and particularly to Mr. Murphy, otherwise the facts are the results of my own investigation.

Ilongot can not be said to live in villages, for their houses are not closely grouped, but are scattered about within hallooing distance on the slopes of cañons where clearings have been made. Each little locality has its name and is usually occupied by families with blood or social ties between them, and several such localities within a few hours' travel of one another form a friendly group. Outside of this group all other Ilongot as well as all other peoples are blood enemies, to be hunted, murdered and decapitated as occasion permits.

The most considerable body of Ilongot appears to be those living east of the towns of Nueva Vizcaya from Mount Palali south, along a high-wooded range to the district of "Biruk," nearly east of Karanglan.

Here are some important occupied sites that go by the names of Kampote, Kanatwan, Kanadem, Makebengat, Oyao and Biruk, as well as others. Homes are shifted from time to time as new clearings have to be made, and the name of a community's home will vary and can not always be relied on. All of these communities seem to be in fairly friendly relations with one another, though they are not bound together by tribal or political ties. Southeast on the rough hillsides of the Kaseknan River, the country first traversed by Mr. Bryant's party in January, 1909, are several communities of very wild Ilongot, Sugak, Kumian and Dakgang. These places were greatly alarmed by the

AN ILONGOT MAN AT WORK IN CLEARING.

He wears the peculiarly shaped Ilongot knife, the usual head covering and a shell ear-ring. The wavy hair on head, face and limbs strongly suggests the Negrito.

approach of the party and used every effort to persuade it to pass without visiting at their houses. Conversations had to be held by shouting back and forth across deep gorges, and approach was very difficult. These people have scattered rancherias toward Baler and sustain trading relations with the Tagalog of that town, but are hostile with the Ilongot of the Nueva Vizcaya jurisdiction. Appurtenant to the towns of Karanglan and Pantabangan are a few minor communities, among them Patakgao. Finally, further north on the Rio Kaga-

yan, toward the province of Isabela, we have the Ilongot communities in which Dr. Jones worked, and lost his life, Dumabato, Kagadyangan and others. It may be that these Ilongot communicate with the Tagalog town of Kasiguran. In all of these communities together there are probably only a couple of thousand souls at most. Few communities have as many as twenty houses or 200 souls; the most are isolated groups of four or five married couples and their immediate relations. The harsh nature of their country, unsanitary life, occasional epidemics and most of all their petual warfare contribute toward their diminution rather than their increase.

A YOUNG WOMAN OF OYAO, NUEVA VIZCAYA.
Photograph taken in 1904.

AN ILONGOT MAN OF BAYYAIT, NUEVA VIZCAYA.
The photograph shows the curious deer skin cape and hat worn by the men when hunting or traveling in the rain.

Like other primitive Malayan people who live in the forest, the Ilongot support life by cultivating a forest clearing or "kaingin." The great trees are girdled, men ascend their smooth clean trunks a hundred feet or more and daringly lop away their branches and stems that the life of the tree may be destroyed and the sunlight be admitted to the earth below. At Patakgao I was shown some beautiful long

pieces of the rattan an inch and a half in diameter with elaborately woven loops at the ends. These are swung from one tree top to another and serve as passage-ways for the men at work. To cross they stand on the slack cable, one hand grasping it on each side, and so, crouching, pass along it at a height above the ground of 80 to 100 feet. With this in mind, I could understand their replying to my inquiry as to when they prayed, by saying that they "prayed and sang to the spirits when they went to climb the trees." Their crops are mountain rice, camotes or sweet potatoes, gabi or taro, maize, squash, bananas, tapioca and, in some places, sugar cane and tobacco. They are good gardeners, although all their cultivation is by hand, their tools being a short hoe or trowel and a wooden planting stick, which is ornamented with very tasteful carving.

The houses of the Ilongot are of two sorts. Sometimes they are low wretched hovels, built two or three feet above the ground, with roofs of grass and sides of bark. But frequently the Ilongot build really well-constructed and creditable homes. These are set high above the ground, fully twelve feet, on a large number of posts or piles; the floor is made of carefully set strips of palma brava, the door-posts, lintels and exposed pieces of framework are curiously and tastefully carved. Such a dwelling is built large and spacious for the occupancy of several families and there is usually a hearth in each of the four corners of the big, single room. Such a house set on a conspicuous ridge and lifted by its piles high among the foliage of the surrounding jungle is a striking and almost an imposing sight.

The arms of the Ilongot are the spear, the jungle knife which they forge into a peculiar form, wide and curving at the point, a slender, bent shield of light wood and the bow and arrow. The use of the latter weapons is significant and here, as always in Malaysia, it indicates Negrito influence and mixture. They use a bow of palma brava and the ingenious jointed arrow of the Negrito with point attached by a long cord of rattan to the shaft, which separates and dragging behind the transfixed animal impedes his escape.

Both men and women wear the long rattan waist belt wound many times about the loins with clouts and skirts of beaten bark cloth. The men also use a curious rain hat not unlike a fireman's helmet, made of rattan and deerskin, the light frame neatly decorated with carving, and a deerskin rain coat to cover their backs in the dripping forest.

The physical type of the Ilongot is peculiar and rather unlike that of any other Philippine people. The men are small, with long bodies and very short legs, weak, effeminate faces, occasionally bearded. The hair is worn long, but usually coiled upon the head and held by a rattan net. The color of the Ilongot is brown and a little lighter than that of Malayans exposed to the sun by life on the water or in the plain. Their head hair is sometimes nearly straight, usually wavy and occa-

ILONGOT MEN AND WOMEN CLEARING THE GROUND FOR RICE PLANTING.

The men have a characteristic trowel. The women have planting sticks of hard wood elaborately carved. The man with the curly head indicates the Negrito blood in these people.

sionally quite curly. These rather unusual characteristics of the Ilongot have led to some absurdly exaggerated reports of their appearance.

My measurements include 15 men, 8 women and a young boy whose stature is disregarded. The height of the men varied from 1,439 mm. to 1,610 mm., the mean being about 1,540, a very small stature though considerably above the Negrito. The stature of the women was from 1,386 mm. to 1,510 mm., the mean being about 1,440. The cephalic index of all but four of the 24 individuals was between 89 and 80 (brachycephalic), one was 79.9, two were 79, and one 76 (mesaticephalic). The nasal index of all but six varied from 100 to 87 (markedly platyrhinian), while the remaining six had indices from 83 to 76. The mean index of all was 88.6. The arm reach, as is usual in Negritic peoples, exceeded the height.

A peculiarity of the Ilongot face is that, while it is relatively wide at the cheek bones, it narrows rapidly below, giving the effect of a pentagonal shaped face with sharp chin. The eyes are relatively well opened and clear, like the eye of the Negrito, without slant or folding lid.

In the Ilongot then we have a small, shortlegged, wavy or curly-haired man, round headed generally, flat and broad nosed, with occasionally bearded face and restless nervous physiognomy. Most of these are not characteristics of the ordinary forest Malayan; on the contrary, they suggest the Negrito, and occasion the belief, in my own mind, that the Ilongot is, like many other peoples of the Philippines and Malaysia, a mixed race resulting from the union of Negrito and Malayan.

From what has already been said it is apparent that in Ilongot society we have a most rudimentary stage of political development. There is no tribe. There is no chieftanship. There are no social classes, for the Ilongot have neither aristocracy nor slaves nor what is very common in most Malayan communities, a class of bonded debtors. They have words to designate such classes, a slave being "sina lima" and a debtor "makiotang," but this information was imparted with the repeated statement, "There are none here." I was unable to get any word whatever for a chieftain, although the Ilongot of Neuva Vizcaya spoke of the "nalahaian" or head of the body of kin, but this person seemed to be only the oldest influential relation in the family group. The Ilongot of Patakgao said it was customary to hold a council called "pogon" but it was evident that this gathering was without definite constitution. The feebleness of the political life of the Ilongot can be appreciated by comparing it to the Igorot, the sturdy mountain headhunters in the Cordillera to the west. The Igorot likewise have no conception of the tribe but they do have thoroughly organized towns and town life. They have a detailed social system, based primarily on the possession of wealth; there are slaves, servant and indebted classes, and a carefully developed and adequate body of law covering property,

inheritance, conveyance and contract. Thus the political life of the Igorot, although exceedingly weak on the side of federation or agreement between the independent towns, is centuries of development ahead of the almost institutionless communities of the Ilongot.

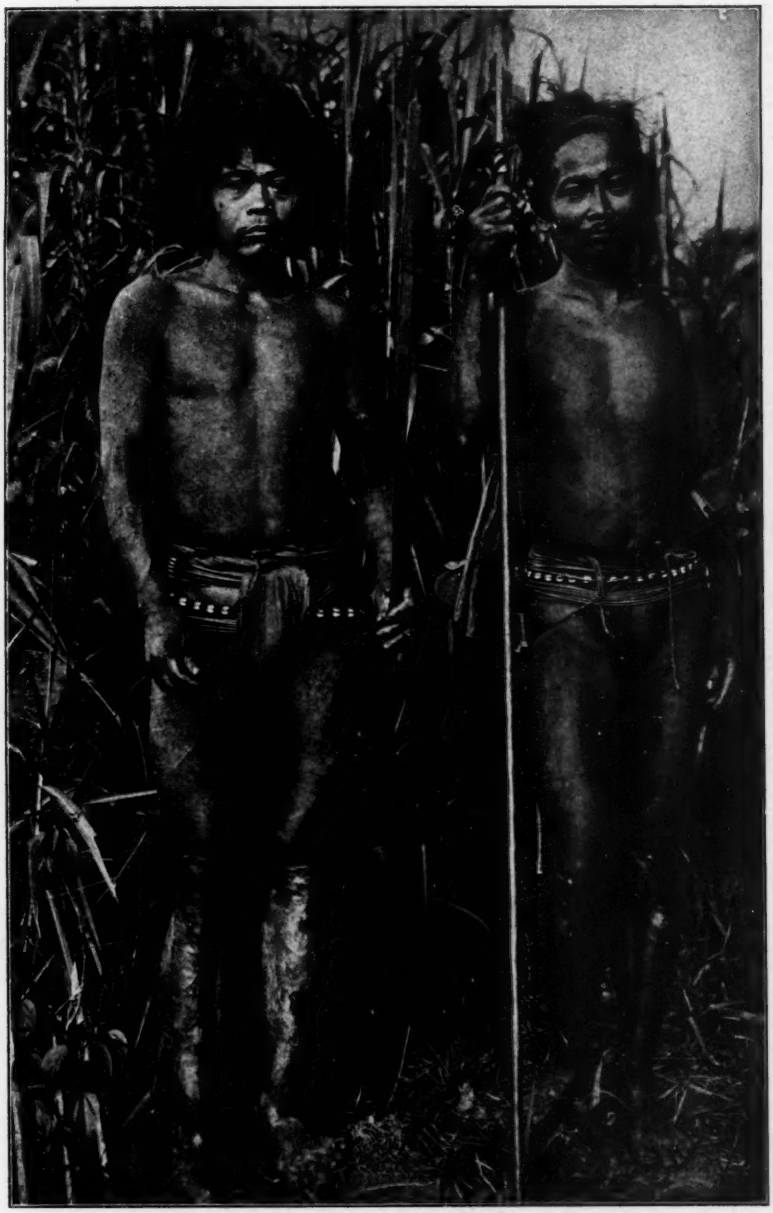
The Ilongot appears to be usually a monogamist and the wife is purchased, or at least a dowry called "piyat" is paid in weapons, utensils, liquor, wire, etc. Her position is not at all that of a bought piece of property, but, like the woman in Malayan society generally, she is the companion and almost the equal in influence and independence of the man.

While the machinery for righting injuries or settling grievances is almost non-existent, the Ilongot has a strong sense of injury and of wrongful acts. He will say with the strongest feeling and disgust that certain actions are "forbidden" (ma kŭl).

I once asked an Ilongot what he would do if a man of a neighboring community, with which relations were peaceful, should come and steal his pig. He thereupon detailed the steps open to him. He might take his weapons and go within hallooing distance of the aggressor's home and demand a double fine or restitution ("baiyad"). If the demand did not avail he would make a solemn warning ("tongtongan") and then, if satisfaction did not follow, there was no recourse but retaliation. I believe, however, that compensation, even for such offenses as murder, is frequently arranged through the anxiety of all members of the family to escape retaliation. Feud, that inevitably arises under such social conditions as these, pursues generation after generation and the obligation that descends to posterity and relations to take vengeance is spoken of as the "debt of life" (utang nu biay).

Apart from the taking of heads as an act of vengeance, murder with the winning of the gruesome trophy is obligatory on the other occasions as well. An Ilongot once said to me "A man may during his life take three, four or even five heads, but he must take *one,* and that before he marries. This head he carries to the relations of his intended wife to prove that his heart and body are strong to defend her." Furthermore, after the palay harvest each year the bundles of unthreshed rice or palay are neatly piled into a stack about a tall stake which is set up in the "kaingin." Then, for some ungodly reason, a human head is very desirable to place on top of this pole. So raids are made, usually on the Christian settlements below. Several questions may be asked regarding these practises, but I can offer nothing by way of answer. To whom is the "debt of life" owed? To the spirit of the dead person? To the customary Malayan spirits of the forest? Only a long acquaintance would enable one to get to the bottom of the motive of such customs as these.

The primitive Malayan is full of beliefs and dreads of the malignant spirits which throng his environment. These are the spirits of forest,



ILONGOT MEN OF PULUDPUD IN THE FORMER SPANISH COMMANDERY OF PRINCIPE.

One carries a bow and arrow, the other a spear with a point which detaches itself from the shaft to which it is attached by a long cord. The dragging shaft impedes the escape of the animal that has been speared until the hunters can come up and dispatch it.

trees, cañons, streams and sea; horribly conceived monsters and ghouls, and furthermore, and omnipresent in the affairs of the living, are the spirits of the dead—the ghosts. The Negrito, on the contrary, seems to be very little disturbed by such beliefs. His elementary religious notions leave him free for the most part from terror by night or by day. Where troubled with conceptions of "anito" or "diwata" it is almost certain that he has been learning at the feet of some demon-worshipping Malayan. Now, the Ilongot appear to have religious ideas that have come from various sources. Those of Nueva Vizcaya, with whom I talked, professed belief in spirits and called them "bĕ tung"; the spirits of the dead were "gi na vá." The Ilongot of Patakgao, curiously, have been affected by Christian nomenclature. The ruling spirit or spirits is "apo sen diot" ("apo" meaning lord or sir and "diot" being a corruption of *Dios*). They had no word for heaven, but mentioned "Impiĕdno" (*Infierno*). They said that when people die "they go to the mountains." They bury the dead near their houses in a coffin of bark (ko ko). They said that there were no "aswang" (malignant monsters believed in by the Christian Filipinos) in their mountains. They stated that prayer is a frequent observance; that they prayed when some one is sick or injured. "When an animal is killed we pray before cutting up the animal," and as stated above prayer is offered before the dangerous ascent of trees. In one house I saw a little bundle of grasses which was put there, following prayer made "at the first time when we are eating the new rice." Prayer is then made that rats may not destroy the harvest or other ill occur to crops.

These notes are too fragmentary to give any definite idea of what the religion of the Ilongot may be, but two other things observed had religious significance. When our party reached the vicinity of the community at Patakgao, we encountered in the bed of the cañon we were following a curious contrivance placed over the running water. Two stakes had been set up, and attached horizontally was a branch twelve feet long, five or six feet from the ground. A chicken had been sacrificed here and its blood had been daubed along this pole in at least eighteen different stains. Feathers had been tied to the ends of the upright poles and midway between them a curiously whittled stick of shavings was tied perpendicularly and the giblets and head of the fowl stuck upon it. Our guide, who was a Christian native from a small barrio which has some relations with this community, pronounced this contrivance to be a warning against further approach, in fact a "dead line." But later, Bŭliŭd, one of the important men of Patakgao, insisted that it was an offering made for the cure of their wounds received a few days before in a fight with hostile Ilongot.

In the houses of the Ilongot at Bayyait were many curiously whittled sticks suspended from the rafters. Some of these were of ir-

regular shape like a ray of lightning; many were bunches of shavings, singularly suggestive of the prayer sticks of the Ainu.

The language of the Ilongot is predominantly Malayan. It contains a large bulk of words identical or related to the surrounding Malayan tongues. There are a few Sanskrit or Indian words, "pagi" (palay, "paddy," the unhulled rice) and "pana" for arrow, both words widely diffused in Malaysia. But besides, there is a doubtful element which does not seem to be Malayan; at least no similar words or roots occur in any of the other vocabularies of primitive peoples of northern Luzon collected by me. The Ilongot continually makes use of a short ŭ, which sometimes becomes the German sound ü as in "buh dük," a flower. These sounds can not be imitated by the Christian people in contact with them. This is a condition similar to what we find in Negrito speech, where, with a preponderance of terms occurring in Malayan languages, are often a number of totally distinct and usually eccentric words and sounds.

Finally, it is manifest that the Ilongot are a problem to the government of the islands. What is to be done with such people as these? They can not be allowed to continue, as they have done, to harass and murder the peaceful population of Nueva Ecija, northern Pangasinan and Nueva Vizcaya. Some means must be found to restrain them. Humanity does not permit their extermination. Steps are now being taken to do something to get them in hand. The exploring parties above referred to have opened the way. The communities organized under teachers of the Bureau of Education seem to promise something as well. Last fall when I left the islands search was being made for the right sort of an American teacher to put in charge of school interests at Baler, with jurisdiction over the Ilongot villages appurtenant thereto. The people of Patakgao since my visit have accepted an invitation, then made, to send their young men and boys to the barrio of San Juan, a village in the mountains back of Pantabangan, where a school is conducted and where several of these youth are now living in charge of a native man in whom the Ilongot have confidence. The Bureau of Education meets the slight expenses of this educational experiment. This work of social development, here as in a thousand similar places in the Philippines, will be best done by the American teacher, but the task is inviting only to the man in whom the spirit of youth and adventure and fascination with human problems runs strong.

Mr. Murphy's last report concluded, "I believe the schools can do these people a great amount of good and solve the government's worst problems. The work, however, is dangerous, as the man who undertakes it has no protection but his own diplomacy in handling the people. If trouble comes it will be from the young bucks, desirous of gaining a reputation."

KANT AND EVOLUTION

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I

IT has come to be one of the generally accepted legends of the history of science that the author of the "Kritik der reinen Vernunft" was also a pioneer of evolutionism. In the anthropological essays of the Koenigsberger, for example—we are assured by the writer of a German treatise on Kant's philosophy of nature[1]—"we already find the most essential conceptions of the modern theory of descent indicated, at least in germ—and, indeed, in a way that marks Kant out as a direct precursor of Darwin." The same expositor says:

> Throughout these writings the idea of evolution plays everywhere the same rôle as in contemporary science. . . . The series of organisms is for Kant in a constant flux, in which the seemingly so stable differentiæ of genera and species have in reality only a relative and subsidiary significance.

And in a famous passage of the "Kritik der Urteilskraft," says another writer, "the present-day doctrine of descent is clearly expressed in its fundamental features."[2] Haeckel, who is in the main followed by Osborn, goes even farther in his ascription of Darwinian and "monistic" ideas to Kant's earlier works, though he thinks that in later life Kant fell from grace. Haeckel says:[3]

> In various works of Kant, especially in those written in his earlier years (between 1755 and 1775) are scattered a number of very important passages which would justify our placing him by the side of Lamarck and Goethe as the principal and most interesting of Darwin's precursors. . . . He maintains the derivation of the various organisms from common primary forms, . . . and was the first to discover the principle of the "struggle for existence" and the theory of selection. For these reasons we should unconditionally have to assign a place of honor in the history of the theory of development to our mighty Koenigsberg philosopher, were it not that, unfortunately, these remarkable monistic ideas of young Kant were at a subsequent period wholly suppressed by the overwhelming influence of the dualistic, Christian conception of the universe.

[1] Drews, "Kants Naturphilosophie," 1894, pp. 44, 48.

[2] Schultze, "Kant and Darwin," 1875, p. 217. Schultze's monograph, perhaps the earliest, and hitherto the most comprehensive, on the subject, seems to be responsible for much of the error into which subsequent writers have fallen. It consists, indeed, chiefly of reprints of the greater part of each of the writings in which Kant approaches the topic in question; but it is accompanied by a commentary and notes in which Schultze gives a highly misleading impression of Kant's actual utterances.

[3] "History of Creation," Lankester's translation, 1892, p. 103. Cf. Osborn, "From the Greeks to Darwin," 1894, pp. 98–9.

Yet even at the last, though Kant's nature-philosophy became less "monistic," Haeckel finds his biology scarcely less evolutionistic. In the "Kritik of Judgment" Kant, according to Haeckel, still "asserts the necessity of a genealogical conception of the series of organisms, if we at all wish to understand it scientifically." In the supposition of a marked "change of view from Kant's earlier to his later years" with respect to the applicability of the principles of natural causation in the realm of the organic, Osborn concurs with Haeckel. Finally, the writer of the historical article in the volume issued by English biologists in commemoration of the Darwin centenary, declares that Kant may be "best regarded as the culmination of the evolutionist philosophers" of the eighteenth century.[4]

These accounts of Kant's historic position in relation to transformism are interesting but scarcely accurate. Kant wrote for the most part at a time when the conception of organic evolution had been made familiar by two of the most celebrated and most influential men of science of the period, Maupertuis and Buffon. He was himself throughout his life especially interested in two distinct scientific problems, both of which made a consideration of the hypothesis of the mutability of species inevitable, and an acceptance of it natural. He accordingly more than once refers to it. But on no occasion does he unequivocally express belief in it; and on several occasions, some of them in his earlier, some in his "critical," period, he vehemently rejects it. The utmost that can be said for him as a biological evolutionist is that, late in life, he once timidly coquetted with the hypothesis—speaking in a vaguely favorable way of it in the text, and then in a definitely unfavorable way in a footnote; and that at the very end of the century it occurred to him to wonder whether the higher apes may not yet acquire a gait, speech and intellectual powers similar to man's. On the other hand, it is not true that any such change of view as Haeckel and Osborn have described took place in Kant's mind with respect to the possibility of explaining the origin of organisms or the processes of organic life in mechanistic terms. Kant at no time affirmed any such possibility; and he repeatedly gave expression to an emphatic denial of it, in his earlier as well as his later utterances. Upon both this question and the question of descent, so far as any change of emphasis is distinguishable at all in Kant's successive opinions, it is a change in quite the contrary direction to that which Haeckel indicates.

These statements, in view of the wide prevalence of contrary be-

[4] J. Arthur Thomson in "Darwin and Modern Science," p. 6. Similar expressions from a number of other writers might be cited. I have myself, before coming to close quarters with the subject, fallen into the error of classifying Kant among the early evolutionists (*Popular Science Monthly*, November, 1909, p. 513). Yet for the past twenty years a substantially correct account of the matter has been accessible, in a brief article by J. Brock, *Biologisches Centralblatt*, Bd. VIII., 1888–9, pp. 641–8.

liefs, can be properly substantiated only by an examination of all the more important writings of Kant (in their approximate chronological order) which bear upon the topic in question. Such an examination will at the same time show that the misapprehensions of his position which have arisen are by no means unnatural results of taking certain of his expressions apart from their contexts and in disregard of the meanings which he was accustomed to give to certain terms.

1. *The "Universal Natural History and Theory of the Heavens."* —That Kant in his earliest important writing, the "Allgemeine Naturgeschichte und Theorie des Himmels," 1755, gave an outline sketch of cosmic evolution which anticipated the nebular hypothesis of Laplace, is one of the things that every schoolboy knows. Like most such things, it is not exactly true. Kant's cosmological speculations were, as we shall see, in scope and in method and in their most essential principles, extremely dissimilar to the nebular hypothesis. Kant's enterprise was far more ambitious than that of the French astronomer; he was concerned with the evolution of a universe out of primeval chaos, not merely with the formation of a planetary system out of a whirling nebula. As a detail of his scheme, it is true, he sought also to explain how planets are formed, and how their orbital revolution is to be accounted for; but his version of their origin is such as to justify us in classifying him with a school of cosmogonists of much later date than Laplace, who are strongly opposed to Laplace's hypothesis. Kant's treatise in its entirety will, I think, hardly be found to merit the extravagant eulogies which it has won—at any rate, upon the score of originality or of historic influence and importance. On these two points, at least, we shall find it necessary to agree with a German writer who has recently dealt with the book. Gerland says:[5]

> An epoch-making or a foundation-laying piece of work it has not been, either for the eighteenth century or the nineteenth. The assertion of Kuno Fischer and others that Kant became by virtue of it "the founder of modern cosmogony," is a false and unhistorical exaggeration. It would be justified only if Kant's book had been the first in its field, and if our present cosmogony had developed in direct dependence upon it; but nothing is farther from being the case—in spite of a number of points of coincidence between Kant's conceptions and contemporary ones.

Gerland adds the opinion that Kant's book remained unknown in its own time, "not because of the bankruptcy of the publisher [which for many years interfered materially with its sale], nor through the fault of the people or of the men of science of Kant's day; it remained unknown through its own faults."

Even at the risk of a somewhat lengthy digression from the question of Kant's place in the history of biology—with which this paper is primarily concerned—I think it worth while to try to make clear the

[5] *Kantstudien*, 1905, 417 f.

historic relations of his cosmic evolutionism to that of both his predecessors and his successors. The matter has never, it seems to me, been quite justly set forth. It will at the same time be pertinent to observe the position with respect to organic evolution in which Kant's cosmic evolutionism left him.

The great, outstanding scientific event of the early eighteenth century was the triumph of the Newtonian system of celestial mechanics, based on the principle of gravitation in accordance with the law of inverse squares, over the Cartesian system of vortices, which had dominated seventeenth century physics and astronomy. Now Descartes, a more versatile and ingenious and a bolder mind than Newton, had himself elaborated his physical theories into a comprehensive philosophy of nature and a fairly detailed cosmology and cosmogony. But Newton had inscribed upon the last page of the "Principia" the maxim *hypotheses non fingo;* moved both by scientific caution and by religious piety, he had deliberately refrained from putting forward either a general system of the heavens outside of the solar system or a mechanistic explanation of the genesis of the revolutional and rotatory motions and the arrangement of the planets of our system. "All these regular motions," declared the concluding scholium of the great treatise, "do not have their origin from mechanical causes. . . . This most elegant structure of sun and planets and comets could not have arisen apart from the wisdom and the rule of an intelligent and powerful being." And Newton sums up with, as it were, a "let us hear the conclusion of the whole matter," by which he would define the whole duty of explanatory astronomy: *Satis est quod gravitas revera existat, et agat secundum leges a nobis expositas, et ad corporum cælestium et maris nostri motus omnes sufficiat.* "It is enough that gravity really exists, and that it acts according to the laws which we have set forth, and that it suffices for all the motions of the heavenly bodies and of our sea."

But to many of those who devoted themselves with enthusiasm to the propagation of Newton's positive doctrines, the self-denying ordinance with which he had ended was far from agreeable. That that ordinance should be transgressed by more intrepid and more architectonic minds was inevitable. We find, therefore, in the early eighteenth century a number of writers who busied themselves with the further elaboration of the Newtonian "natural philosophy," with the application of Newton's laws to problems the master himself had refused to discuss. In these attempts the writers in question were in part merely doing over again upon Newtonian principles what had already been done upon Cartesian principles (now discovered to be erroneous) by Descartes himself. Among the German enthusiasts for the completion of Newton's system and the extension of it into a general cosmology, one of the most zealous and most active was the young Kant. His early preoccupation with these matters was doubtless due to the influence of

one of his university teachers, Knutzen, professor of logic and metaphysics at Koenigsberg, who was at once an ardent Pietist, an ardent Wolffian, and an ardent Newtonian. All of the earliest three considerable writings[6] of Kant may be said to be chiefly attempts to give new applications to Newton's principles, or to supply his omissions, or to do both at once. Of these three, the treatise with which we are here concerned, the "Allgemeine Naturgeschichte" of 1755, was an endeavor to fill up two of the most obvious gaps (from the cosmical system-maker's point of view) which the author of the "Principia" had left. It required no great originality and no stroke of genius on Kant's part to recognize these gaps and to devise the general outlines of the hypotheses by which he tried to fill them. The problems, and in one of the two cases at least, the proposed solution even in most of its details, were present in the scientific atmosphere of the period as epidemic infections.

The first of these gaps, and the one less pertinent to our present topic, lay in Newton's failure to suggest even a conjectural hypothesis concerning the systematic arrangement of the heavenly bodies beyond the boundaries of our system. To three of his disciples at almost the same time[7]—but to the two others at an earlier date than to Kant—it occurred as a "probable," though perhaps not strictly verifiable, supposition that our group of planets with its central sun is only a part of an analogous but larger concentric system of revolving bodies, or of similar groups of bodies, constituting the Milky Way; and that this in turn is but part of a single, universal system, all the members of which are similarly arranged with respect to one another, and revolve about a body at the center of gravitation of the entire universe in accordance with Newton's laws. The hypothesis had, of course, an attractive combination of grandiosity and simplicity; and it was natural enough to inquire whether or not it were true. But it was, I suppose, essentially incapable of any serious testing by any data then in the possession of astronomers. It is apparently only within the past five years that some light has been thrown upon the problem of a possible "systematic arrangement" of the fixed stars;[8] and the arrangement which recent te-

[6] "On the True Mode of Estimating *Vis Viva*," 1747; "Universal Natural History and Theory of the Heavens," 1755; "Physical Monadology," 1756.

[7] To Thomas Wright, of Durham, before 1750; to Lambert, 1749; and to Kant. Wright's "Original Theory or New Hypothesis of the Universe, founded upon the Laws of Nature and solving by Mathematical Principles the General Phenomena of the Visible Creation," London, 1750, was known to Kant through a summary in the Hamburg *Freie Urteile*, 1751, and is referred to by him in the "Allgemeine Naturgeschichte." Lambert's "Kosmologische Briefe" were not published until 1761, but were planned and partly written in 1749, as Lambert declares in a letter to Kant, November 13, 1765.

[8] See the article of Eddington on "Star-Streams," in *Scientia*, VIII., 1910, p. 40.

search seems to disclose is not in the least such as Kant imagined. Kant himself is at pains to notify his readers, in his preface, that his reasonings on the subject do not pretend to "extreme geometrical precision and mathematical infallibility." Yet it can not be denied that in the body of the work Kant presents his hypothesis as if it could be, and had been, established with rather more than a high degree of probability.

> If all the worlds and systems of worlds acknowledge the same mode of origination; if attraction is unlimited and universal, while the repulsion of the elements is likewise everywhere active; if in the infinite both great and small are small alike;—then must not all these worlds have received the same relative constitution and systematic arrangement as that which the bodies of our own solar system exhibit on a small scale? . . . If, again, these are viewed as members in the great chain of Universal Nature, then there is still the same reason to think of them, in turn, as existing in the same reciprocal relations and interconnections—which, in virtue of the primary structural law ruling all nature, make of them a new and greater system, ruled by a body of incomparably mightier attractive force at the center of their systematically ordered positions.

Thus the whole universe will compose a single system held together "by the connecting power of gravity and of centrifugal force." For if it were made up, instead, of a multitude of irregularly scattered systems, of groups of stars not in revolution about a central body, Kant argues that, in order to prevent the reciprocal attractions of these systems from "destroying them" there would be requisite

> such an exactly measured disposition of them at distances proportionate to the attractions, that even the slightest displacement of them would bring about the ruin of the universe. . . . But a world-order that could not maintain itself without a miracle would lack that character of stability which is the distinguishing mark of the designs of God. It is therefore far more consistent with those designs to make the whole creation a single system in which all the worlds and systems of worlds that fill the whole of infinite space stand related to a single center.[9]

It will, I suppose, hardly be maintained, even by Kant's most devout admirers, that in his argumentation in behalf of his "theory of the heavens" he displays a high degree of scientific caution or a very nice sense for the distinction between the considerations that are, and those that are not, admissible in scientific inference.

The second undeveloped problem which Newton had left to tempt the ingenuity of his disciples was the problem of cosmogony. In attacking this upon Newtonian principles Kant showed no greater originality; he had many forerunners in the enterprise, in the preceding half century, and the enterprise itself was an obvious one. For the celestial mechanics of Descartes had found one of its earliest and most striking applications in a cosmogony. Descartes's first book, his "Traité du Monde," written in 1633, had been chiefly a treatise on cosmic evolu-

[9] "Allgemeine Naturgeschichte," 1798 ed., pp. 77–85; tr. in Hastie, "Kant's Cosmogony," p. 136 f.

tion based upon mechanical principles. That book had, it is true, been suppressed by its author, who, upon hearing of the treatment received by Galileo, had preferred to take no chances for the prize of martyrdom. But he had in Pt. V. of the "Discourse on Method" recapitulated briefly the outline of his scheme of world-evolution; in the "Principia" he had given some of the details of it; and the treatise itself, or a revision of the principal part of it, had been published after his death by his friend Clerselier, in 1664. While refraining, with what might seem sufficiently unimpeachable orthodoxy, from maintaining that the present constitution of the world actually had been evolved, rather than created ready made, Descartes also insisted that it was perfectly conceivable that it should have been evolved. He declared himself ready, if given as a starting point even "a chaos more confused and involved than any poet ever could describe," to deduce, with the aid only of the ordinary laws of the motion of matter, the necessity of the gradual formation out of that primeval chaos of a world having the characters and the contents of the world as man now finds it. He endeavored to show how matter "must needs, in consequence of those laws, have arranged itself in a certain way which made it similar to our heavens; how some of its parts would necessarily become an earth, and some planets and comets, and others a sun and fixed stars. And . . . coming to speak more particularly of the earth," he set forth, "how the mountains, seas, fountains and rivers can naturally have been formed in it, and the metals have come to exist in the mines, and the plants to grow in the fields, and, in general, how all the bodies which are called mixed or composite could have been generated."

Now, it is certain that Kant had the cosmogony of Descartes in mind in writing the "Universal Natural History," for he refers to it in his preface. Defending himself against the imputation of materialism and irreligion, Kant writes:

> I shall not be refused the justice which fair judges have always rendered to Descartes, with respect to his attempt to explain the formation of the world from purely mechanical laws. I therefore cite the remark upon this subject of the authors of the "Universal History": "We can not but think the essay of the philosopher who endeavored to account for the formation of the world in a certain time from rude matter, from the sole continuation of a motion once impressed, and reduced to a few simple and general laws; or of others who have since attempted the same, with more applause, from the original properties of matter, with which it was endued at the creation, is so far from being criminal or injurious to God, as some have imagined, that it is rather giving a more sublime idea of his infinite wisdom."[10]

Thus Kant, anticipating vituperation from the orthodox on account of his cosmic evolutionism, pleads not only the Cartesian precedent, but

[10] The version of the citation here given is that of the original English, as in Hastie's "Kant's Cosmogony."

also the favorable views already taken of that precedent by writers of recognized respectability.

Moreover, as the passage just cited indicates, Descartes was not the only, though he was the most eminent, predecessor of Kant to set an example of an undertaking similar to that upon which Kant was entering. Hypotheses about the origin of the world or of our planet may be said to have been especially in fashion during the late seventeenth and early eighteenth century. In the words of Cuvier,[11]

> The end of the seventeenth century saw the birth of a new science, which took in its infancy the high-sounding name of "Theory of the Earth." Starting from a small number of facts badly observed, connecting them by fantastic suppositions, it professed to go back to the origin of worlds, to, as it were, play with them, and to create their history.

The "Theoria Telluris Sacra," 1681, 1689, and the "Archæologiæ Philosophicæ," 1692, of Thomas Burnet, and the "New Theory of the Earth," 1696, of William Whiston—successor to Newton's professorship at Cambridge, effective popularizer of the Newtonian doctrines, and the supposed original of Goldsmith's "Dr. Primrose"—were based upon an incongruous mixture of scientific and scriptural considerations; but they at least made cosmogony a topic of general interest. As much, if little more, can be said of Woodward's "Essay toward a Natural History of the Earth and Terrestrial Bodies," 1695. But in 1734 there was published at Leipsic a treatise which resembled Laplace's theory much more nearly than did Kant's. The "Principia rerum naturalium" of Swedenborg—already celebrated as a geologist and metallurgist, not yet celebrated as a mystic and religious reformer—enunciated the following theses:[12]

> That the sun is the center of a vortex; that it rotates upon its axis; that the solar matter concentrated itself into a belt or zone or ring at the equator, or rather at the ecliptic; that by the attenuation of the ring it became disrupted; that upon the disruption, parts of the matter collected into globes; . . . that the globes of solar matter were projected into space; . . . that in proportion as the igneous matter thus projected receded from the sun it gradually experienced refrigeration and consequent condensation; that hence followed the formation of the elements of ether, air, aqueous vapor, etc., until the planets finally reached their present orbit; that during this period the earth experienced a succession of geological changes which originated all the varieties in the mineral kingdom, and laid, as it were, the basis of the vegetable and afterwards of the animal kingdoms.

The idea of planetary evolution was thus anything but a novelty in 1755. What is more, the decade immediately preceding the completion of Kant's "Allgemeine Naturgeschichte" may be said to have been especially distinguished by the prominence with which, during it, questions of cosmogony were brought to the attention of the learned world.

[11] "Eloge de Werner," cited in Packard's "Lamarck," p. 92.

[12] I borrow the summary of Clissold, from his introduction to the English translation of Swedenborg's "Principia," 1846.

The work from which Kant quoted a justification of Descartes's enterprise—and, by implication, of his own—the "Universal History" (1736–65) appeared in an (incomplete) German translation in 1744. This huge historical compilation, one of the great publishing enterprises of the time, contained an introduction of (in the German edition) over one hundred pages devoted to the subject of cosmogony, giving the theories of the Greek philosophers, of Descartes, Burnet, Whiston and other moderns, and a new hypothesis of the author's own. In 1749 the first volume of a still more celebrated, and scarcely less voluminous, publication—Buffon's "Histoire Naturelle"—saw the light. This volume was chiefly devoted to a "history and theory of the earth," with a chapter on the formation of planets which contained ideas more closely related than those of Kant to the nebular hypothesis. Buffon remarked upon the peculiar uniformities of the solar system which seemed to call for a mechanical explanation, but which gravitation alone did not account for, viz., the revolution of all the planets in the same direction, approximately in the same plane, and in nearly circular orbits. Buffon's own explanation of these phenomena in his "Théorie de la Terre" of 1749 is given in the following passages:

> This uniformity of position and direction in the movement of the planets necessarily presupposes some common factor in their original movement of impulsion, and makes us suspect that it has been communicated to them by one and the same cause. . . . This impulsive force was certainly imparted to the stars in general by the hand of God when he set the universe in motion. But since, in physical science, we ought to abstain so far as possible from having recourse to causes outside of nature, it seems to me that in the solar system we can account for this impelling force in a sufficiently probable manner and in accordance with the principles of mechanics. . . . May it not with some probability be imagined that a comet falling upon the surface of the sun may have separated from that body certain parts, to which it has communicated a movement of impulsion in a common direction? . . . The planets would thus have formerly belonged to the sun, and would have been detached from it by an impelling force, common to all alike, which they still retain.[13]

Buffon was the only one[14] of his precursors (of the post-Newtonian period) known to Laplace. He made this passage of the "Histoire Naturelle" the starting point of his own earliest exposition of his nebular hypothesis, in the concluding chapter of the "Système du Monde." The hypothesis of Buffon, he remarked, accounted for most of the non-gravitational peculiarities of planetary motion that require to be accounted for; but since there remained certain other such phenomena which Buffon's supposition could not explain, a new hypothesis must be devised.

Finally, in the same year, 1749, a generation after its famous

[13] "Histoire Naturelle," first ed., I., pp. 131–133. Kant had read Buffon before writing his own cosmogony; see "Universal Natural History," Pt. II., ch. 2.

[14] Cf. "Système du Monde," first ed., 1796, II., p. 298.

author's death, the "Protogæa" of Leibniz was published. In this Leibniz contended, on grounds now familiar enough, that the earth must have originally been in a fluid and intensely heated state; that through the cooling of the surface a solid crust was formed and the viscous fiery substance of the globe concentrated in the interior; that the present earth-structure is due to the successive action in the past of fire (fusion) and water (sedimentation); and that the existence of fossils testifies to the extinction of once flourishing species of animals, in consequence of modifications of the earth's surface due to one or the other of these agencies.

For comparison with the hypotheses of his precursors and successors, Kant's own scheme of cosmogony must now be indicated in its more essential features. He assumes for a starting point a "state of nature which is the very simplest that could follow upon nonentity," namely, a chaos in which all the matter in the universe was scattered throughout infinite space. It somehow "filled" the whole of that space, and yet its component particles were infinitely more diffused than now; Kant expressly declares that space was once "full," and is now "empty," except for the actual celestial bodies. The original particles were not all alike; they differed in "specific density and force of attraction." Consequently, when the universe is once permitted to begin active business, "the scattered elements of the denser sort, by virtue of their attraction, gather together out of the space surrounding them all the matter of less specific gravity; these elements in turn, with the material which has united with them, collect in points where the particles of a yet denser kind are found"; and so on.

If we follow in imagination this process by which nature fashions itself into form throughout the whole extent of chaos, we easily perceive that the sole result of this process would consist finally in the agglomeration of divers masses which, when their formation was complete, would be forever at rest and unmoved.

Fortunately, nature has other forces at her command; besides gravitation, there is also operative a force of repulsion, which shows itself "especially when matter is decomposed into fine particles." By this force the elements, "as they fall towards the attracting body are deflected by one another and have their perpendicular fall converted into a movement of revolution." Having indicated the two general working principles of his cosmical mechanics, Kant now judiciously leaves the problem of the genesis of a universe, and turns somewhat abruptly to the simpler problem of the formation of our solar system, from the solution of which "we shall be able by analogy to infer a similar mode of origination in the case of the larger world-systems."

The lesser process, as Kant conceives it, may be said to fall into four stages: (1) *The formation of the nucleus of a sun.* There is formed at the point of maximum attraction of a given region of space, "a body which, so to say, grows from an infinitely small germ, at first

slowly (through chemical attraction), then more rapidly (through the so-called Newtonian attraction), and always in proportion as its mass increases, draws the surrounding parts more and more strongly to unite with itself." This central body is not strictly to be called a sun at the outset, for it is not yet "in a flaming state"; this it only gradually becomes as, in the course of the subsequent processes of readjustment, "the lighter and more volatile portions of the primitive matter," failing to maintain a movement of periodic revolution, drop into the center of attraction. (2) *The formation of a whirl of unaggregated particles moving round this central body in circular but separate and intersecting orbits.*

When the mass of the central body has grown to such a point that the velocity with which it draws particles to itself from great distances is, by the weak degrees of repulsion with which the particles impede one another, deflected into lateral motions which, by virtue of centrifugal force, encompass the central body in an orbit—then there are produced great whirls of particles, each of which, by reason of the composition of the gravitational force and the force making for deflection sideways, describes a curved line. These orbits all intersect one another . . . and are in conflict with one another.

(3) *The transformation of this disordered whirl of particles into a ring or disc of particles moving in free, parallel, circular orbits round the central body.* The conflicting movements of the preceding stage come eventually to such an adjustment that they interfere with one another as little as possible. This happens in two ways:

First, by the particles limiting each others' movements till they all advance in one direction; second, by their limiting their vertical movements towards the center of attraction till, all moving horizontally in parallel circles round the sun as their center, they no longer intersect one another's paths, and, by the equalization of the centrifugal and centripetal forces, they maintain themselves constantly in free circular orbits. In this state, when all the particles are moving in one direction and in parallel circles, the conflict and collision of the elementary bodies is annulled, and all things are then in the condition of least reciprocal interference.

Further, "in acordance with the laws of centrifugal motion, all these revolutions must intersect the center of attraction with the plane of their orbits"; and for bodies moving in a common direction round a common axis, there is only one such plane. Therefore, the revolving particles gather about "that circle which passes through the rotation of the axis in the center of the common attraction," and the system assumes (though there are as yet no planets) that discoid form characteristic of our present planetary system. (4) *The gradual formation, within this ring, of planets, through the attractions subsisting between the separate particles composing it.* Kant has hitherto treated attraction chiefly as operative between the central mass and the particles; between particle and particle the relation has been one of repulsion. But at this point, "the attraction of the elementary bodies for one another begins to produce its effect, and thereby gives the start to new

formations which are the seeds of the future planets. For the particles, as they move round the sun in parallel circles and at not too great a difference of distance from the sun, are, by the equality of their parallel motion, almost at rest with respect to one another, and thus the attraction of those particles which are of a higher specific attraction immediately produces an important effect, namely, the collection of those nearest one another so as to form a body which, in proportion to the growth of its mass, extends its attraction farther and draws elements from a wide region to unite with it in its further formation."

It must be left to mathematicians and astronomers to assess the precise merits of these speculations in comparison with those of Kant's predecessors and successors in the same undertaking. But as to the historic affinities of Kant's hypothesis the facts seem so clear that even a layman may pronounce upon them. The Kantian scheme is as different from Laplace's as any post-Newtonian cosmogony could well be. For it does not start with a gaseous, rotating, heated nebula; it does not explain the direction of revolution and rotation of the planets as derived from the rotation of a mass formerly cohering with that now constituting the sun; it does not regard the planets as having ever formed part of any such mass. It is well-known that the rings of Saturn suggested the most characteristic feature of Laplace's theory. Kant has a chapter explaining these rings much as Laplace does; but he expressly insists that "the ring which surrounds Saturn was *not* acquired in the general way, nor has been produced by the universal laws of formation which have ruled the whole system of the planets." On the other hand, it is not quite exact to identify (as does Hastie[15]) Kant's system of planetary evolution with the meteoritic hypothesis of Lockyer and G. H. Darwin. So far as I understand these matters, Kant's cosmogony most nearly resembles an extremely recent doctrine upon the subject—the planetesimal hypothesis of Chamberlin and Salisbury. In the words of those authors:

> Under the typical form of that hypothesis it is assumed that the parent nebula of the solar system is formed of innumerable small bodies, planetesimals, revolving about a central gaseous mass much as the planets do to-day. The evolution of the system consisted in the aggregation of these innumerable small bodies into much fewer large ones. . . . The hypothesis, therefore, postulates no fundamental change in the system of dynamics after the nebula was once formed, but only an assemblage of the scattered material. The state of dispersion of the material at the outset, as now, was maintained by *orbital revolution*, or, more closely speaking, by the centrifugal acceleration arising from revolution.[16]

[15] "Kant's Cosmogony," 1900, p. lxxxiv. At this date, of course, the planetesimal type of hypothesis had hardly been differentiated from the meteoritic.

[16] Chamberlin and Salisbury, "Geology," 1906, II., p. 38. The authors of this theory have failed to recognize in Kant an early prophet of their own doctrine, and have referred to him, in the conventional manner, as having held a hypothesis "somewhat similar" to Laplace's (*op. cit.*, p. 4).

There are, of course, very material differences between the contemporary and the Kantian form of the hypothesis; notably, our contemporary geologists ascribe "the gathering of the planetesimals to the nuclei, to form the planets, essentially to conjunctions in the course of their orbital motions, not," as does Kant, "to simple gravitation, except as gravitation was the fundamental cause of the orbital motions." But in the two cardinal points Kant's *is* a planetesimal theory: (1) it conceives the planets to have grown by gradual accretions from very small nuclei, not to have been condensed from large masses "abandoned" or thrown off by a rotating, gaseous sphere; (2) it also conceives these nuclei to have been in regular orbital revolution about a central body *before* the formation of planets as such. The first trait distinguishes both the planetesimal and the meteoritic hypotheses from the general type of theory to which the conjectures of Swedenborg, Buffon and Laplace alike belong; the second is the specific mark differentiating the planetesimal hypothesis in turn from the meteoritic. "If," in the words of Chamberlin and Salisbury, "the meteorites could be supposed to come together so as to revolve in harmonious orbits about a common center, on a planetary basis, the assemblage might be perpetuated, but this takes the case out of the typical meteoritic class, and carries it over to the planetesimal." It is precisely this that we find exemplified in the third stage of the Kantian cosmogony.

Whether, in view of the state of knowledge in his time, Kant had any good reasons for preferring his theory to those of the other type which Swedenborg and Buffon had already put forward, I shall not venture to discuss. In any case, the features of Kant's cosmogony which establish its kinship with the planetesimal hypothesis are closely connected with one of the most elusive and most questionable details of his system of dynamics—namely, his "force of repulsion." It is this and this alone which (to his mind) explains why particles, as they fall towards the center of attraction, are "deflected sideways" and thus have their rectilinear motion converted into movement of revolution. It is likewise the establishment of an equilibrium between repulsive and attractive forces that, as he conceives, gives shape and determinate limits of size, not only to planets, but to all coherent and individuated masses of matter.[17] This notion of a *Zurückstossungskraft,* which he took over from Newton, but the use of which to explain revolutional motion Newton would never have sanctioned, was a favorite one with Kant from the beginning of his career to the end; he reverts to it so late as 1786, in his "Metaphysical Foundations of Natural Science." It is in the "Physical Monadology," 1756, that we get the most definite account of it. We there learn the quantitative formula for this force, when acting between any two bodies; while attraction decreases in proportion to the square of the distance, repulsion decreases

[17] "Monadologia Physica," X.

in proportion to the cube.[18] Kant seeks, by reasonings both obscure and peculiar, to establish an *a priori* necessity that these two forces—emanating from identical points and perfectly analogous save in the direction of the motion of the external particles they affect—should yet differ in the ratio in which their potency decreases with distance. But in the "Universal Natural History" the disciple of Newton bases no calculations, such as could be compared with the actual positions and densities of the heavenly bodies, upon this quantitative formula—of which, possibly, he had not yet bethought himself. In fact, in his cosmogony he wholly fails to indicate even an approximate law of the action of repulsive force. When the plot of the world-story threatens to come to a standstill or to issue in a hopeless entanglement, "repulsion" like a *deus ex machina* appears upon the scene to set things right and ensure a happy ending. Precisely the same particles, under what (so far as one can judge from Kant's language) might be similar physical conditions, and at approximately equal distances, figure now as attracting, now as repelling, one another, as the exigencies of the hypothesis require. That a theorist who improvised laws of dynamics in so easy-going a manner proves to have anticipated a very recent conception of planetary evolution, must, I think, be regarded rather as evidence of good luck than of scientific good management.

What, now, was, for Kant himself, the bearing of his doctrine of cosmic evolution upon biology? Descartes, holding the theory of animal automatism, had undoubtedly regarded the formation of organisms as part of that mechanical process of the redistribution of matter which also explained the formation of suns and planets. Such a view was not necessarily equivalent to a belief in the transformation of species. There is no necessary logical connection (though there is a natural affinity) between a mechanistic physiology and transformism—any more than between a vitalistic physiology and the doctrine of the fixity of species. Thus the question concerning the relation of cosmic evolutionism to biology is merely the genetic form of the issue of vitalism *versus* mechanism; in it the problems of the theory of descent need not be directly implicated. Upon this question a view current in Kant's time was that the gradual genesis of inorganic things might well be ex-

[18] Kant's conception of "repulsive force" is used by him in the "Physical Monadology" primarily to explain the impenetrability of bodies (for which he supposes that a special force must be posited). But it is not identical with impenetrability; it is explicitly represented by him as a force acting *in distans*. In the "Universal Natural History" it is rather to the phenomena of solutions and the expansion of gases that Kant points as empirical evidence of the existence of such a force. Newton ("Optics," Bk. III., Q. 31) had made a like inference from the same phenomena; but he did not write, as Kant did, seventeen years after D. Bernouilli had propounded the kinetic theory of gases. And it is impossible to imagine Newton deducing a cosmogony by the use of a conception so loose and quantitatively indefinite as is Kant's conception of repulsive force in the "Universal Natural History."

plained from mechanical principles, but that no such explanation could be given of the origin and the characters of living beings. Such was the position taken by the author of the introduction to the "Universal History," whom we have already seen Kant quoting.

> The manner of the original formation of plants and animals, in which the wisdom of the Creator principally appears, has never been accounted for by any philosopher with any tolerable success; matter and the laws of motion having nothing at all to do in these things, whatever they have in the inanimate parts of the world.[19]

And this was substantially the attitude which Kant adopted, in the one passage of the "Allgemeine Naturgeschichte" in which he definitely discusses the matter.

> We are in a position to say: "Give me matter and I will construct a world." For given matter endued with the essential force of attraction, and [all astronomical phenomena] . . . can be traced back to the simplest mechanical causes, which causes we may confidently hope to discover. . . . But can we boast of any such advantage with respect to the meanest plant or insect? Are we in a position to say: "Give me matter and I will show you how a caterpillar is generated"? Do we not in this case, from the very first step in our quest, remain in ignorance of the true inner constitution of the object in question and of the complexity of the manifold parts composing it? It should surprise no one, therefore, when I venture to say that the formation of all the heavenly bodies, the cause of their motions, in short, the origin of the entire present constitution of the universe, will become completely intelligible, before the generation of a single herb or caterpillar can be made wholly clear from mechanical principles.

This passage is, perhaps, capable of being construed as expressing rather an *ignoramus* than an *ignorabimus*. But considering it in conjunction with the uniform tenor of Kant's subsequent writings, we are justified, I think, in saying that he at no time admitted the possibility of bringing organisms within the compass of a scheme of cosmic evolution based upon mechanistic principles. He was, in short, throughout his career a vitalist, though in later life a curiously inconsistent one. The notion of an original "spontaneous generation" of life out of the inorganic always roused his aversion. Yet, as I have remarked, a vitalist may without inconsistency be a transformist; living beings, once produced by non-mechanical causes, may still conceivably change their forms in the course of natural descent. But Kant throughout most of his life looked upon the theories of spontaneous generation and of the transformation of species with so blinding a hostility that he could scarcely tell them apart. We shall find that some thirty-five years of reflection were required before he was able to make so simple a discrimination as to recognize that, from the point of view of his own biological philosophy, the two stood upon a different, even though both stood upon an unsound, footing.

2. *The Review of Moscati on Man's Upright Posture.*—In 1771

[19] *Op. cit.*, 1736, I., p. 43.

Kant wrote a review of a disquisition by an Italian anatomist, Moscati,[20] on the difference between the structure of man and that of the lower animals. Moscati's principal contention was that the upright posture is not "natural" to man, and was not his primitive attitude. Upon this Kant remarks in part as follows:

> Here we have once more the natural man upon all fours—an acute anatomist having traced him back to that condition. Dr. Moscati shows that the upright gait of man is forced and contrary to nature, and that his structure is such that this position, when it has become necessary and habitual, entails upon man various disorders and diseases—clear proof enough that he has been led by reason and imitation to depart from his primitive animal posture. In his inner constitution man is not formed otherwise than as are all the quadrupeds. . . . Paradoxical as this conclusion of our Italian physician may seem, yet in the hands of so acute and philosophical an anatomist it attains to almost complete certainty (*erhält er beinahe eine völlige Gewissheit*). We see from this that nature's first care was for the preservation of man as an animal, in his own interest and that of the species; and for this purpose the posture which was best adapted to his internal structure, to the position of the fœtus, and to protection against dangers, was the four-footed one; but we see also that there lay in man a germ of reason, through the development of which he was to become fitted for society. He consequently assumed the posture most suitable to this, that of a biped. By virtue of this, man, on the one hand infinitely surpasses the animals; but, on the other hand, he is obliged to endure certain disorders that afflict him in consequence of his having raised his head so proudly above his former comrades.

Here, then, Kant readily accepts the doctrine that man was originally a four-footed animal, which, *pari passu* with its unique development of rationality and of the social instincts, assumed the upright attitude. His promptness in making the views of Moscati his own certainly indicates a general predisposition to evolutionary ways of thinking; and, if we had no other expressions of Kant's dealing with the subject more directly, it would be not unnatural to construe this assertion of the descent of civilized man from quadrupedal ancestors as equivalent to an assertion of the mutability of species. Yet the latter doctrine, it must be noted, is nowhere expressed or directly implied in the review of Moscati; and it will presently become clear that Kant would not have regarded it as a legitimate inference from any of his admissions about the earlier condition of humanity. From the time of publication of this review to the end of his life Kant seems to have remained what may be called an anthropological evolutionist; but he deliberately refused to make the transition from this position to a general biological evolutionism.

[20] Moscati was professor of anatomy at the University of Pavia. His book appeared in 1770; a German translation by Beckmann, professor in Göttingen, was published in 1771.

(*To be continued*)

CLASSICS AND THE COLLEGE COURSE

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TWO or three years ago, the acting president of a state university praised the small college for exalting the humanities, for making "study of the great classics compulsory but attractive. It has always found more power for both head and heart in the noble lines of the Iliad and in the majestic music of the Æneid than in study of the nervous system of the frog or the life history of the *Harpiphorus maculatus,* interesting and important as those are."

Somewhat later, a man of great eminence announced that "we have turned away young men and some young women from the great classical ideals of self-sacrifice in fields where they could do the most unselfish work."

Still later, laments have become more numerous and have increased in pungency. It has been discovered that the study of Greek and Latin no longer holds preeminence in colleges and universities, whereas in women's colleges the "humanities are still honored." A distinguished writer of elegant literature has remarked that "our women really have some use for the education of a gentleman, but our men have none."

The acting president, no doubt, pleased his hearers, but there must have been among them some who were surprised to learn that compulsory study of the great classics had been made attractive. The speaker's remarks were elliptical or the compositor dropped the words "to some," which ought to have completed the sentence. The excellent results of this attractive study have not always been apparent. Even fifty years ago, when Harvard and Yale had fewer students than are claimed by some "small" colleges of this day, it was matter of common report that few graduates could read their diplomas and that Latin text-books had been thrust out of theological seminaries, because the niceties of syntax and not the niceties of ancient heresies engrossed the students' attention. If the noble lines of the Iliad and the majestic music of the Æneid have exerted material influence upon the head and heart of youths in American colleges during the last half century, they must have done so through the "Bohn," that essential portion of the average man's equipment.

One, considering the claims made by defenders of classical courses, might imagine that in Greece and Rome there existed the ideal condition, that social and political life were lofty, in contrast throughout

with conditions existing in modern times. He is led to suppose that later periods offer nothing to compare with the Iliad and Æneid; with the intellect of Aristotle; with the morals of Cicero, Seneca and Marcus Aurelius; with the philosophy or excellence of Socrates and Plato; with the daintiness of the Greek lyric poets; with the abandon of Horace; or with the heroism of Marathon and Thermopylæ. He is led to suppose that one must look to Greece and Rome for models of purity and devotion; he is told that only by study of the classical writers can he gain sure foundation in morals and true intellectual polish; that the fulness of the Greek language was the outcome of God's desire to have a fit vehicle for revelation. And finally he is left to gather that our colleges by their teaching of Greek and Latin enable students to come in close touch with all this nobility of thought and life.

Yet no one need feel humiliation because he lives in an inferior age or belongs to a deteriorated race. The sentences extolling the distant past mean nothing; they are but echoes from voices of the long-buried Humanists, which by long reverberation have become polished in form, musical in rhythm. No "literary function" would be complete unless some modern Humanist had repeated them with the fervor of a Thibetan priest.

No one denies that the author of the Iliad had marvelous skill in description, but not a few have regretted that a writer of such ability had no better subject than the quarrels and combats of lustful savages, whose exploits, so vividly pictured, are those of mere brutes. In point of morals, the Homeric poems are not superior to the Kalevala, to which they are inferior in imagery. Of course, this matter is one of taste, but one may be pardoned for supposing that the Kalevala, less extravagant in description than the Iliad, would have gained the stronger hold on popular fame if it too had been translated by Alexander Pope. But neither the Iliad nor the Æneid is superior to Paradise Lost or to the Inferno, which, produced by greater intellects, are free from the grossness which characterizes the Homeric poems.

Aristotle no more typified Greek intellect than Ajax typified Greek physique, or than a building with forty-five stories typifies New York's dwelling houses. He was a giant amid pygmies, a phenomenon in the Greek intellectual sky as startling as was Donati's comet in our physical sky, half a century ago. Like Leibnitz, Kant and Spencer, he broke away from the trammels which bound his contemporaries and devoted himself to the study of actual conditions in search of sure basis for philosophy. Like Leibnitz, Kant and Spencer, he received the maledictions of those who belonged to the prevailing schools. Were he living now he would be but one of many, possibly the chief. It is unjust to compare him with Spencer, as some have done, for the latter lived in an age of greater knowledge and greater advantages. Plato's reputa-

tion is due in no small degree to the fact that his style is ponderous enough to prevent popularization of his works and to conceal defects in his system of social morals; he will continue to be read by only a few and the verdict of four centuries ago is likely to remain unchallenged. But his enduring reputation is due quite as much to his influence on Christian theology as to his profundity of thought.

Socrates, as described by his disciples, was a picturesque but by no means a wholly inviting personality. A careless sloven, of unattractive face and figure, a lounger at street corners, neglectful of obligations to his family, casting slurs publicly on his burdened wife, he was able, in spite of all, to hold the admiration of a thoughtful dreamer like Plato, of a young rake like Alcibiades, of brilliant young men about town like Xenophon and Critias. His range of thought was wide and his versatility remarkable; he could discuss lofty and commonplace topics with equal ease; he was able to speak with authority respecting the immortality of the soul and with equal authority he could advise the fashionable prostitute, Theodote, as to the best methods of coaxing and of retaining her lovers. Socrates was unquestionably a man of great intellect and through his disciples he has exerted great influence on the world; in his personal morals, he was far superior to his surroundings; but he was very far from being the ideal sage.

The essays by Cicero and Seneca are so lofty in tone that the reader is puzzled to determine whether they were written under the influence of a stinging conscience or simply to prove that high thinking may survive low living. Too many moralists then, as in later days, were like guide posts on a wagon—pointing in one direction while traveling in another. It is absurd to look to Greece and Rome for models of purity and devotion. The condition of Greece, literary Greece, was gross beyond conception; it was utter foulness. The lyric poets were dainty indeed, but their daintiness too often was exhausted in admiration of the basest vices. Epictetus, in praising the virtue of Socrates, tells incidentally the whole story of Greek morals; while the high esteem in which the Homeric poems were held shows that, beneath the veneer of civilization, there still existed the savage, even among the scholars. And this was evidenced equally by the glorification of physical perfection; they could not plead the excuse of American college presidents, that it gave them free advertising. In Rome, gross immorality had gained full sway even during the golden age of literature; while, in later times, the moral conditions were so bad that men and women, who would be ordinary mortals in our day, became by contrast with those about them the immortal models of purity and devotion; the dreary platitudes of a Marcus Aurelius shine amid the moral darkness as diamonds in a pile of rubbish.

The models of honor to be found among Grecian statesmen are such

as one might seek to-day among the heroes of Central and South America. The history of Grecian public affairs is a continuous tale of treachery and dishonor. Treaties between the states were made only to be broken; truth was unknown and other nations, however much they might disagree in reference to most subjects, were one in believing that the Greek was always a liar. The petty affairs of Marathon and Thermopylæ have been matched a thousand times in every land. A New York policeman attacking a band of armed ruffians, single handed, without the moral support of 300 or 10,000 companions, is a nobler spectacle than that at either of the Greek battlefields—and it occurs every week. The hand-to-hand combat on Cemetery Hill at Gettysburg, where men fought until barely three scores remained in each regiment and the combat ended only because the survivors fell exhausted, was truer martial heroism than anything in Grecian history.

The modern world unquestionably owes much to Greece and Rome, but much less than many would have us believe. The shackles forged by the Greek and Roman intellect crippled development after the revival of learning and centuries passed before men succeeded in casting them off. One must concede unhesitatingly the brilliancy of many ancient writers, but that is not to say that they excelled or even equalled those of modern times. Modern thinkers excel those of the classic world, because the horizon is farther away; just as civilized man with many concepts excels the Greenlander or Hottentot with his few concepts. And it may be said in passing that Greek civilization was not self-originated. It was but the full blossoming of Egypt and Babylonia, a blossoming which ignored the trunk and roots whence it was derived.

But granting that the ancients did excel the moderns in intellectual power and in loftiness of thought, one is compelled to ask the classicist why college students are not permitted to come into contact with the authors themselves. One may assert, without any fear of successful contradiction, that the teaching of Latin and Greek as given in the vast majority of our colleges during the last half century, has not done this; for few men have acquired in college such familiar knowledge of the language as would enable them to think much of what the author said. Their labor was expended on lexicon work and construction. If these extollers of classic intellect are honest in their plea, why do they neglect genuine study of the authors in the college course? Plato, Seneca, Lucretius and the rest have been done into English in such fashion that the study might be made attractive to the last degree, while the English versions themselves could be used as models of style. But this has not been suggested. The clamor respecting the glory of ancient days is but a plea for restoration of classical courses to the pre-eminent place in college. But it is wholly irrelevant. As well might one urge the grandeur of St. Peter's at Rome to support a demand that

courses in masonry and stone cutting be added to the college curriculum. The plea is not consistent. The Hebrew people and the Hebrew Scriptures have had greater influence upon mankind than that exerted by the Greeks and Romans or their literature, yet no one has demanded that lads be drilled in the accents and paradigms of the Hebrew language. The Greeks owed their civilization to Egypt and Babylonia, yet no one has wept because the study of hieroglyphics and cuneiform is not a prominent feature in the curriculum of secondary schools and colleges. English translations suffice for these languages; it is difficult to conceive why they should not suffice for Greek and Latin.

It is not easy to discover grounds justifying diatribes against the changed attitude toward Latin and Greek as college studies. When one challenges the correctness of the classicist's position, the good man seems to be shocked by the questioner's audacity, he wanders amid generalities and usually finds relief in gloomy reflections respecting this utilitarian age. But the classicist forgets or does not know that, until very recent times, the study of Latin and Greek had nothing whatever to do with mental training, was not supposed to have any special value in that connection. It was as purely utilitarian as the study of bookkeeping in a commercial school, the erection of an anvil in a blacksmith's shop or the purchase of a ticket before entering the train. The would-be student learned Latin just as he learned to read—that the road to knowledge or to preferment might be open to him. In the old universities lectures and text-books were in Latin; many of the Christian Fathers wrote in Greek and would-be theologians needed that language. The university was closed to the man ignorant of Latin as an American college is closed to the man ignorant of English. It was for this reason that when colleges were founded in this land, the chief emphasis was given to the classic tongues; they were established merely as schools preparatory to the university work of theological seminaries, whose text-books were in Latin and Greek.

But the Roman church lost control of the intellectual world; Latin ceased to be the universal language of scholars; lectures and text-books were given in the vernacular. Even theological seminaries, outside of the Roman church, discarded the old text-books and replaced them with modern works of less polemic spirit. Seventy-five years ago all excuse for keeping Latin and Greek in the college curriculum had disappeared. Those languages had held their place because of utility and that had disappeared. But the colleges were here, the largest of them very small; their curriculum was a survival of the past, no longer useful, it was barely ornamental. A new era had been opened by the study of science, but those who controlled the colleges knew nothing of science and most of them thought of it only as an invention of the devil—a new way of

diverting men from consideration of the spiritual to love of the material. Then came the genius who, remembering the classical statement that the first step in education is the study of words, asserted that the chief thing is the study of words; and he discovered that in the study of Latin and Greek words one gains an all-around training, a "mental culture" which is imparted by no other study. With that came the conception that colleges are to give a "liberal education" without any reference to utility. For more than half a century the gospel of culture has been preached by college graduates, who, too often, are themselves living proofs of its falsity.

It is difficult to speak or to write meekly respecting the ceaseless chatter about "culture" and the "education of a gentleman." If study of Greek and Latin in college should make men "cultured," should convert them into "gentlemen," there must be something wrong in the mode of teaching or in the mode of study, for the results are not wholly gratifying. Of course, there may be a difference of opinion as to the meaning of "culture." If it mean comfortable self-satisfaction without basis of knowledge, certainly a very great number of men have acquired "culture" at slight cost; an insignificant quantity of classical or other lore found lodgment in their minds and their chief relic of college days is the recollection that they took the classical course. But if "culture" mean intellectual breadth, judicial attitude of mind, the ability to express one's thoughts clearly, not much of it could be acquired in the old classical course and still less in a modern classical group.

But one is told that a tree is known by its fruits, and the classicist proceeds to prove results by presenting a long list of brilliant authors who studied classics, while he challenges his opponent to show a similar list made up from graduates of non-classical courses. This can not be regarded as a legitimate argument. A field of blasted corn always contains a considerable number of good ears. If one should take the whole product, he might be inclined to say that the classical course is destructive of culture and that the men on the list were those who had escaped the blasting influence of the study; for a very great proportion of the graduates who have entered professional life, exhibit a charming indifference to the rules of rhetoric and notable inability to express their thoughts clearly. But the argument is worthless in either direction. It is absurd as an argument for teaching the classics; nearly all of the polished writers in this land and Great Britain were graduated before the change in curriculum came about; they had to study the classics or nothing.

The writer holds no brief for defence of any special type of education or of any special curriculum but he maintains that a curriculum which ignores utility is wasteful. All training should aim to make a

man conscious of his worth to himself and to his fellows; it should fit him and should stimulate him to make the most of himself so as to leave the world in some sense better than he found it. One may concede that mental polish is very important and at the same time he would be consistent in asserting that to spend years under the polishing process with nothing but veneer to show at the end is an insult to common sense. Something of service should be acquired in the interval. It has been said that the aim of education should be to enable a man to enjoy his leisure; that would make of education a luxury. But one must recognize that, fortunately or unfortunately, all but a very few men have to earn their bread and that to them the years between sixteen and twenty are all-important, being those during which intelligent acquisition of knowledge is made most easily. Since the study of language is essential, the language in the curriculum should be useful. English, German and French are quite as difficult as Latin and Greek, and their literature is sufficiently inspiring. If those languages were taught as the classic languages were taught in American colleges one hundred years ago, the student would have acquired the needed mental polish and he would have the knowledge which is demanded, whether he enter a profession or devote himself to business pursuits.

LEARNING FOREIGN LANGUAGES

By Dr. CHARLES W. SUPER

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WHEN we consider that in all the high schools and colleges of christendom, with few exceptions, the pupils are required to study one or more foreign languages, we can not but admit that the subject is one of the utmost importance. And more than this: in the public schools of many of our large cities thousands of children are engaged in the study of English, which is to them a foreign language. Since in the latter case the end in view is solely and directly practical, we need not consider this phase of the problem further in this connection. It is only within the memory of many men now living that the value of such studies has been called in question; or more especially, the relative value of the ancient and modern languages. A few decades ago the latter had either no place or a very subordinate one in the educational curriculum. Every young man who entered college was required to have some knowledge of Greek and Latin. In a few institutions he might pursue a modern language, or perhaps two, but this part of the course was perfunctorily gone over because regarded as subordinate. After a score or less of recitations from the grammar the student was put to reading. Then a few master-pieces were in whole or in part rapidly gone over and that was the end of the program. So far as the principles of language-structure were concerned the student was supposed to have learned them along with his Latin and Greek. Gradually, however, the modern languages received an increasing share of attention, until at the present time in many of our largest universities not five per cent. of the students take Greek, while neither Greek nor Latin is required for graduation. In most high schools the former is not taught, and in all it no longer occupies the post of honor. In this country the contest between the progressives and the conservatives was carried on without much bitterness; but in Germany the latter contested every inch of ground and the discussions of the relative value of ancient and modern languages often gave rise to acrimonious debates. It was in fact a contest between the ins and the outs; between the college professors and what may be called the enlightened public; between the traditional views of education and the practical, not to say imperious, demands of the age. Under the old régime an education was supposed to serve a sentimental rather than a practical end. It was not necessary for either law, medicine, or theology, since

comparatively few young men who entered any of these professions had had any systematic training. Owing, however, to the enormous expansion of commerce and manufactures the public began to insist that educational institutions shall make a wisely directed effort towards enabling young people to meet these demands with an adequate preparation. Education was no longer to be confined to the few; it must be so broadened and extended as to include all who wish to prepare themselves to meet the multifarious claims of the present age. Shortly before his death, Lord Salisbury said: "We do not sufficiently cultivate a systematic knowledge of foreign contemporaneous languages." And further: "If I were capable of prescribing the course that ought to be pursued, I should say that those who have to make their living by commerce in any of its stages, from the highest to the lowest, ought to know French and German, and possibly Spanish, before they think of Latin and Greek." Such words as these uttered by a man who had been educated in the conservative atmosphere of Eton and Oxford are highly significant. They not only reflect the prevailing spirit of the latter years of the nineteenth century, but do credit to the insight and freedom from prejudice of the speaker personally. In fact, it may be said of most of the leading English statesmen that in their public capacity they have always been responsive to the demands of their time, notwithstanding the circumstance that most of them were educated under conditions that were essentially medieval. The prominent place occupied until recently by the ancient languages is a heritage of preceding centuries. For more than a thousand years the former was the only language taught in the schools of Europe outside of the domain of the Greek church. It was, however, not the language of pagan but of christian Rome. The renascence added the Greek, which had become a forgotten tongue; but it directed especial attention to the great pagan writers, above all to Cicero. This change in pedagogical material was logical, since it was the substitution of a literature that had a value in itself for one that was hardly more than an auxiliary to the church, and a language that was a highly cultivated medium for the expression of thought, for one that had been developed along narrow lines. There was no other language and no literature that so well served its purpose. Although the church did not look with favor on this innovation, it continued to make progress to such an extent that the ecclesiastical writers were almost wholly extruded from the schools. Cicero was the model to which all authors who strove to attain to elegance of diction endeavored to conform as nearly as they could. Not only was Latin taught in the higher schools and universities, but the lectures in the continental universities were delivered in this tongue. No other language was used by the German professors until near the close of the seventeenth century, where it continued to be employed to some extent within the memory of men now living. In Germany until

about 1570 fully seventy per cent. of books published were in Latin. Those printed in the vernacular were for the most part of a popular character and considered by scholars beneath their notice. One hundred years later the number of Latin and German books issued from the press was about equal. But in fifty years from that date the proportion of the latter to the former was about as one to two. This effort to keep alive a language that no longer had its roots in contemporary thought required a prodigious amount of labor. Nevertheless, the books written by scholars for scholars thus obtained a wider currency than they would have had if any of the vernaculars had been employed. On the other hand, all works that were intended to be contributions to literature were failures. Petrarch wrote most of his books in Latin; yet they are virtually forgotten while his Italian sonnets are known to all students of his vernacular. Many of his contemporaries spent their time in equally fruitless labor. Dante knew better. Although he wrote Latin with ease, he realized that he could not express his inmost thoughts in an alien tongue. He seems to have been the first man of modern times to discern a truth that Macaulay has expressed in his essay on Frederick the Great: "No noble work of imagination, so far as we can recollect, was ever composed by any man, except in a dialect which he had learned without remembering when or how, and which he had spoken with perfect ease before he had analyzed its structure."

When we try to answer the question whether it is worth while to study a language which conveys little or no information that we can not get in our own we are confronted with a serious problem. We can not draw a hard and fast line between what is useful and what is useless, perhaps not even between what is more and what is less useful. Few persons will deny that the beautiful is also useful and that the esthetic taste is as well worth cultivating as any other of our mental powers. The fairest flowers produce no fruit. Music is absolutely of no value, while sculpture and painting in their higher aspects are equally so. The same affirmation may be made of architecture. No man has championed more vigorously and more eloquently the claims of esthetics than the high priest of utilitarianism, John Stuart Mill. He indignantly repudiates the charge that his system would exclude the cultivation of any art that makes life richer or more worth living than the pursuit of the narrowly practical. There is no room for doubt that a student whose native language is English, with an occasional exception, will get a more correct conception of Plato's philosophy, for example, from Jowett's translation and comments than from the original text. Some knowledge of Greek will be serviceable, but it is not essential. If it be answered that no man of scholarly tastes and scientific training will be satisfied with second-hand information, the patent answer is that if we knew nothing except what we have

learned directly our stock of knowledge would be pitifully small. At the utmost, we can make an immediate inspection of the merest fragment of the immense domain of nature and life, while the entire past has for the most part been transmitted to us through many hands. If we purpose to acquire a language for itself alone there is nothing gained by approaching it in a roundabout way. But there is no doubt that if we wish to lay the foundation for studies of a similar character we can not do better than to begin with Latin. A person who knows Latin well will have far less difficulty in acquiring the Romance languages, barring the pronunciation, than he had with the Latin. The great body of the vocabulary of these languages is derived more or less directly from the ancient tongue. Most words, however, which designate modern objects are formed in various ways. Those words that have their roots in the Latin have merely been modified according to phonetic laws that are now well understood. On the other hand, it is admitted by most teachers who can speak from experience that a knowledge of Latin as gained in our schools is of small service in acquiring French, the Romance language most generally taught. With few exceptions the pupils fail to see the connection between the older and the younger vocabulary and teachers have virtually to begin at the beginning. It is only a small minority of learners that acquire French more rapidly because they have studied Latin previously. It is not too much to say that nobody fully comprehends what is written in those languages now called dead. Part of the difficulty is due to variations in the manuscripts, or to their defective character, but it is also largely owing to the impossibility of ascertaining the meaning of many words. To be convinced of this one needs but to examine the copious notes with which most authors have been provided. A few months ago I had occasion to read some of the later Books of the Æneid, a work that I had not had in hand for a number of years. As long as I had only the text before me I thought I understood the author except in a few passages. But after consulting a profusely annotated edition I was in doubt whether I had got the meaning of more than one verse in ten. So many possibilities and probabilities were suggested that nobody could tell who was right. There is always some difficulty in comprehending a profound thinker. But if we know exactly what he said we can usually come pretty close to an understanding of his meaning. If we are uncertain as to the words he wrote we encounter preliminary obstacles which no amount of ingenuity and intellectual acumen can overcome. It is doubtful whether the mind can be most profitably employed in seeking for something which in the nature of the case can not be found. On the other hand, the effort to acquire the facile use of a language, whether ancient or modern, is always a striving towards an attainable goal. We can obtain expert testimony as to whether we have reached it. There are hundreds of persons now

living who understand Greek and Latin more thoroughly than Plato and Xenophon, than Cicero and Virgil understood them. But in the ability to use them there is a wide difference. In order to understand a language we must know its relation to other languages; in order to be able to use it we need to know it only. It profits nothing for the acquirement of a good style to study a foreign tongue. There is no evidence that the Greek classic writers knew any language except their own. When they discuss problems of philology they usually indulge in puerilities. It was not until the rise of the science of language, about a century ago, that scholars began to see the connection of languages with each other and to classify them according to their affinities. But none of the men who have put upon record the results of their investigations were great writers. It would almost seem as if profound thought and facile expression are incompatible. A knowledge of the etymology of words gives us their history and a clue to their meaning; it does not enable us to understand them exactly, nor aid us in the structure of the sentence. Skill in the use of language is a matter of native ability and something which the most painstaking study can not give us. There is a wide difference between the bald statement of facts and grouping them in their relations in such a way as to gratify the esthetic sense. In the latter the imagination plays a large part; but if it be allowed to become unduly prominent, the result is disastrous.

We have no classical Latin that is suitable for boys. This is a strong objection to giving it a place in the lower schools. Almost all the Latin read in both school and college deals with war and politics. Besides, it is too difficult for beginners. More than a century ago a French teacher compiled an elementary reading-book from good writers by omitting difficult constructions and the less interesting passages. It has been in use in Germany and France ever since his time and has been introduced in this country to some extent. Nevertheless, it is merely the old matter somewhat simplified in form. More recently Professor F. W. Newman made an abridged translation of Robinson Crusoe into Latin with a view to providing reading matter for beginners that is both correct in form and interesting at the same time. But his little volume never found a place in the schools. In this respect the ancients were no better off than we are. As soon as the young Greeks and Romans had learned to read a little they were set to work on Homer or some similar author. No account was taken of their mental immaturity. Perhaps the work has already been done; if not, I am sure that he who shall trace the rise and development of text-books for elementary schools will make an interesting contribution to the history of education.

Although the Latin taught in the European schools for more than fifteen hundred years was not that of the classic writers, the proceeding was in many respects more rational than that now in vogue. The

pupils were taught to speak and to write the language, to use it in the affairs of every-day life. It was not only the Latin of books, but of the playground, of the street, of public discussion. While it was not the speech of the common people, it was the general medium of correspondence, of law and of diplomacy, until superseded by French. One needs but to read the letters of Erasmus or the Letters of Obscure Men to see what a facile medium of expression it was. How easily a foreign language may be acquired is daily demonstrated in the public schools of our large cities. The children of the immigrants who come into this country by tens of thousands from all parts of the world usually learn English, to them a foreign tongue, in a year or less. Were it not so common the phenomenon would be called marvelous. Children do not employ the principle of association; they simply yield to the natural instinct to imitate. Unconsciously they strive to reproduce speech-sounds until they get them to conform to those they hear uttered in their presence. When they begin to talk, usually in the second year, their enunciation and pronunciation are very defective. But by constant though unconscious effort they approximate more and more nearly to the correct sounds until they attain complete conformity. When they are engaged in learning two or three languages at the same time they rarely confound them. They usually answer in the language in which they are addressed. Children under favorable conditions before they are old enough to attend school learn a list of some thousand of words without knowing how. Their vocabulary grows faster than their minds. It is easier for them to learn the words that designate common things in two or three languages than to comprehend an unfamiliar idea. After the age of mental maturity the task becomes more and more difficult and is rarely accomplished correctly. There are, however, here and there persons who can, by an effort, reproduce any speech-sound they hear, as long as their auditory apparatus is unimpaired.

Contrary to the popular belief, the ability to speak several languages is not a mark of mental power. It merely indicates a retentive memory of a certain kind and a knack for imitating sounds. Sir Richard Burton relates in one of his books that once when near Jeddah he was accosted by a man in Turkish. Getting no response, he tried Persian; then the same silence made him try Arabic. When his listener still kept silent he grumbled out his astonishment in Hindustani. That also failing, he tried in succession Pushtu, Armenian, English, French and Italian. When Burton could no longer restrain his risibilities, he admitted his nationality and chatted for some time with the stranger in English, which he spoke very well. Professor Starr says in his "The Truth about the Congo" that members of the Bantu tribes are often met with who speak several languages readily. A recent denominational periodical gives the names of several men who preach in four different languages and a larger number in three. One clergyman is

named who uses Spanish, French, Mandarin, Chinese, Japanese, Italian and English. Of another it is said that he preaches in Burmese, German, English, Spanish, Latin, Greek, Hebrew, Danish, French and Quechua. When one visits an auction-room on the continent of Europe at a point where several languages are spoken and prospective buyers arrive from all parts of the world, he may hear the auctioneer drop one language and take up another until all present have heard in their own tongue what the goods are and the bids. One also meets on the trains traveling salesmen who speak several languages with almost equal fluency. Cardinal Mezzofanti, who died in 1849, spoke fifty-eight languages and knew fairly well about fifty more. He was a man of very ordinary ability except that he had a singularly tenacious memory of an unusual kind, so that when he once heard a speech-sound he never forgot it. About twenty years ago there was an employee in one of the London offices who was able to receive and to send telegrams in twelve different languages. But he soon gave himself up to drink and became so unreliable that the company felt obliged to discharge him.

The testimony regarding fluent speakers in several languages must be received with great caution. It is almost always exaggerated, usually very much exaggerated. While there is virtually no limit to the number of languages one may learn to read rapidly and intelligently, their oral use is almost infinitely more difficult. I have taken careful notes for many years and am convinced that not half a dozen men in a generation can speak even three languages simultaneously with native purity. Some years ago a lady informed me that a friend of hers spoke eight languages as well as if each one was his native tongue. I happened to know that the man himself makes no such preposterous claim. I once made the acquaintance of a young Swiss whom I asked what his native dialect was. He replied that he did not know, since he had been brought up to speak German, French, and Italian. As his English was correct and fluent, although he had been in this country only a few years, he probably told the truth. But his pronunciation betrayed the foreigner in every sentence.[1] Many years ago I was making a foot-tour through the Black Forest with a fellow American. Among other things he informed me that he spoke German like a native. Presently we came to a farmhouse at which he asked for some milk. But he gave the word a wrong gender. An ignorant native might have made a mistake in the grammatical structure of his sentence, or he might have had a local pronunciation, but no native would have made a blunder in the gender of this word, since it is not one of those of which the spoken and the written gender differ. It needs to be remarked, however, that the local dialects vary so widely from each other and from the language

[1] It may be stated in this connection that there are districts in Switzerland in which German is the language of every-day life; Italian the language of the school, and French the language of the church.

of books that the natives of one section have great difficulty in comprehending one another. Historically considered, the attitude of intelligent men toward foreign languages presents some interesting aspects. From about 500 B.C. until well into the third century, everybody who laid any claim to be educated or even well informed, spoke Greek, no matter what his native speech might be. The reader of the history of antiquity meets with ever-recurring surprises at the wide dissemination of a language that is now considered particularly difficult. The utility of this knowledge is never mentioned by any writer: it was taken for granted. While the Greeks themselves rarely knew any tongue but their own, all foreigners possessed a speaking knowledge of Greek. Quintillian, who taught in Rome in the first century, urges his pupils to learn Greek at the same time with their mother-tongue. But he deplores the prevalent custom of teaching Roman children Greek before they know Latin. Yet there were virtually neither grammars nor dictionaries. The language was either picked up from those who spoke it or systematically taught by private tutors. Young men of literary tastes often supplemented the instruction gained at home by a brief sojourn in some Greek city. It should be remarked, however, that the Greeks had no need to acquire any other language for either literature or science, since all that was worth knowing was accessible in their native speech. Roman literature is so pervaded with Greek ideas that it is in no sense an original product. It contains hardly a thought that may not be found in Greek. It was in government alone that the Romans developed their own ideas and profited by their own experience. Although the Greek thinkers wrote a great deal upon the theory and practise of administration, the populace paid no heed and failed everywhere. It is a melancholy fact that they never learned wisdom from their constant succession of fiascoes repeated in every city throughout Greek lands.

There is no best method of teaching foreign languages: the method needs to be adapted to the pupil and to the purpose for which a language is learned. If the mind is to be trained at the same time in logical thinking, the procedure will necessarily be different and the results much slower than when the memory of the learner is to be filled with words and phrases to express concepts which are already in existence. Children learn languages because they can not help it; adults, because they want to. There is besides the much larger number who have to be taught for the reason that they are only half in earnest. It is this class of so-called students who furnish one of the serious problems for teachers. If one wants to teach an adult foreigner the English language there is no better method than that which bears the name of M. Gouin. The teacher suits the action to the word or phrase. He stands, he sits down, he gets up, he points to his eyes, his forehead, his hair, and so on, each time using the appropriate words. If he knows

the language of the foreigner he is trying to teach, so much the better. But this knowledge is not essential. In this way the most ignorant person will soon acquire a few hundred words and phrases which will be a nucleus about which he may enlarge his vocabulary as much as he pleases. Although his pronunciation will be very faulty, he will be able to express himself in a way, and to understand fairly well what is said to him. When teacher and pupil are equally in earnest progress will usually be quite rapid up to a certain point. This point is difficult to pass. For the successful teaching of Latin and Greek to schoolboys a much higher degree of pedagogical ability is essential. Here the teacher has to deal with complex thoughts strangely expressed and more or less above the comprehension of the learner, one of the objects of this kind of instruction being to train his mind up to them. The instructor should not only have a competent knowledge of the language he teaches; he should also have psychological insight, fertility in resources, vivacity of manner and a good measure of literary training. When pupils are only half in earnest or somewhat defective in verbal memory, and the teacher lacks any or all of the above-named qualifications, instruction is "up-hill work," and the results decidedly unsatisfactory. My personal observation of the teaching of Latin and Greek leads me to believe that there is generally too much grammatical hair-splitting and too little reading. A teacher needs to know very little about a language to be able to spend day after day with a class discussing verbal niceties. The serious student of a foreign language soon discovers the method that is best for him, and his progress is usually rapid. In any case the text-book ought to occupy an inconspicuous place.

With the advancing years our educational system will supply more and more fully the needs of the rising generation. The time is not far distant when schools will be called into being wherein everything will be taught that is worth learning. So far as languages are concerned, there will always be persons who will study them for their literature rather than for their practical value. There will always be professors of Latin and Greek, although it is a misnomer to call the latter a dead language. It is more alive than the English of Chaucer. Besides, it may be predicted with confidence that those persons whose native tongue is English will have less and less need to learn any other, except for a more or less permanent residence abroad.

SOME EUROPEAN CONDITIONS AFFECTING EMIGRATION

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FROM what economic and social conditions do our immigrants from Europe come? This was the question that came to me after reading book after book concerning the immigrant after he has reached America. A diligent gathering from many sources, chiefly official documents, has brought to light many facts of much interest to one who really cares to know the character of the surroundings of those who are thronging our shores. It is the purpose of this article to present some leading conditions in various countries of Europe.

Russia

One eighth of our immigrants are Russian Jews. Peculiar and pathetic is the lot of the Jew in Russia. A law of 1769, modified in 1804 and in 1835, requires that all Jews, except certain specified classes, shall reside within the Jewish pale. The pale is a district beginning immediately south of the Baltic provinces, stretching throughout the west and extending over the south as far east as the Don Army Territory. It has an area of about 362,000 square miles, or less than 20 per cent. of European Russia, and only a little over 4 per cent. of the entire Russian empire. Outside the pale may reside, under certain restrictions, merchants of the first guild—*i. e.*, merchants paying a very high business license—professional persons and master artisans. As a matter of fact 93.9 per cent. of all Jews in the empire live in the pale, 4 per cent. live in the remaining part of European Russia and 2.1 per cent. live in Asiatic Russia. Even the place of residence within the pale is limited by a provision of the notorious May laws of 1882, which prohibits the Jews from buying or renting lands outside the limits of cities and incorporated towns. Jews who owned farm lands in 1882 were not dispossessed, but the law operates to preclude any increase in such holdings.

Restriction upon his place of residence is not the only limitation placed upon the Jew in Russia. In the summer of 1887 the minister of instruction was empowered to limit the number of Jewish students to be admitted into the secondary institutions of learning. This limit was defined as 10 per cent. for the institutions located within the pale, 5 per cent. in the remaining cities and only 3 per cent. in the two capital cities of Moscow and St. Petersburg. The measure was justified as necessary to maintain a more "normal proportion between the number

of Jewish and christian students." The result of this was that the classes in many classical and technical high schools remained half empty, for in the cities where the Jews constituted from 50 to 75 per cent. of the population only 10 per cent. of the high-school students could be of Jewish faith. Hundreds of Russian Jews go to Germany and adjacent countries to attend the higher schools, many making great sacrifices to do so. Jews became converted to Mohammedanism, thus obtaining full admission to higher educational establishments. Thereupon the senate declared that although Jews might be converted to Mohammedanism they did not thereby escape the disabilities of Jews. As Jews who become christians do escape these disabilities, the determination seems to be to drive them to be baptized.

Since 1889 no Jew in Russia can be admitted to the bar except by a special permit of the minister of justice in each case. Russia employs an enormous number of government servants, but except in rare cases Jews are debarred from such employment. Five per cent. of government physicians and surgeons may be Jews. Private practise of law or medicine is almost the only professional work open to Jews, and as a result these occupations are so crowded that a living income can scarcely be made.

To work as a farm laborer is not forbidden, but it is not attractive. Agricultural laborers receive from 25.8 cents per day in sowing time to 77 cents in harvest in southern Russia, and from 12.9 cents to 25.8 cents in northwestern Russia. Board is not furnished by the employer The standard of living can be judged from the fact that the cost of subsistence is officially estimated at from $23.18 to $25.75 per year—somewhat more than 6 cents per day—and that "the regular daily ration of an agricultural laborer consists of about four pounds of bread, which is sometimes supplemented with a cucumber or a few onions." In Russia, especially outside the pale, the greatest poverty is found in the rural districts and the small villages rather than in the cities as in the United States. This is probably due to the general extreme poverty of the peasantry and to the exorbitant taxation. A typical case is that of a man who paid $40 taxes on twelve acres.

Legal restrictions make the Russian Jews swarm in cities, and so overcrowd all occupations open to them that a high standard of living is often wholly impossible in Russia.

Greece

Greece furnished the United States with 19,489 immigrants during the year ending June 30, 1906, and with 36,580 during the succeeding year. Greeks in the United States send to their home country about $7,720,000 annually.

Rural life is of pastoral simplicity and manufacturing is largely of the home variety, although some mills exist. The cotton mills at Piræus, the port of Athens, run eleven hours per day and the wages

of the operatives, chiefly women and girls, average about 27.5 cents per day. There are few milch cows in Greece. Goats and sheep furnish nearly all of the milk for home consumption and the making of cheese. A few cows are found in Athens, but the price of feed is so high that butter sells at 68.5 cents per pound, cream at $3.27 per gallon and curdled milk at 85.3 cents per gallon.

Austria-Hungary

Economic interest in Hungary centers in the development of manufacturing, especially the manufacturing of textile fabrics.

The act of 1907, which it is hoped will mark the beginning of a new era in Hungarian industry, enables the government to grant subsidies and exemption from taxation to those industries which are considered by the minister of commerce to be worthy of encouragement and desirable from a national economic point of view. Subsidies may be in the form of a lump sum or an annual allowance. The act favors the building of workmen's dwellings and enables the municipal and parish authorities to encourage certain industries by grants of money, etc. It further provides that the state, municipal and parish authorities, the institutions maintained or subventioned by the same, and all enterprises engaged in the service of public traffic shall have their initial requisites supplied and their works carried out by home industry.

About $41,000,000 is thus expended annually. The Hungarian mills are in a new milling district and they must import skilled labor, usually from Austria. They also suffer from the large emigration. About 1,000,000 persons emigrated from Hungary during the eight years ending December 31, 1907. The few Hungarians who return from America are arrogant and discontented. Hungary has 460 apprentice's schools, with 66,030 pupils; twenty-two special industrial schools, with 1,177 pupils, and six industrial schools of higher grade. In a factory town where house rent was from $54 to $58 per year, wages in the factory were as follows: picker hands: men, 40.6 cents per day, women, 30.45 cents; cards, 52.78 cents; card grinder, 80.12 cents; draw frames, 30.45 cents; slubbers, 40.6 cents; mules, one spinner, $1.015, two piecers, 71.05 cents, two boys, 50.75 cents; ring spinning, girls, 24.36 cents to 28.42 cents; reelers, 30.45 cents to 40.6 cents.. In a Bohemian knitting, linen, and woolen mill weekly wages ranged from $1.01 to $4.26 for female workers and from $1.01 to $7.10 for males. The working day is ten hours.

The factories have by no means displaced home industry. In some parts of Bohemia more than one fourth of the entire population is engaged in home manufacture. In the Riesengebirge paper bags and horn or stone buttons are made. Near Reichenau and Gablonz snuff-boxes were formerly made. As the use of snuff decreased, the making of cheap oil paintings on wood, tin and linen began. When the market is good the whole family works night and day and makes a living. In the Adlerhills weekly wages of $1 to $1.20 are paid, but lost time brings the average to not more than 80 cents per week. Sometimes husband

and wife work alternately eighteen hours a day. Some button makers receive 60 cents per week.

Weavers who make at home silk and Jacquard and art work earn $1.40 to $4 a week. The straw and bast matters earn from 20 to 40 cents a day, but after the "season" the wages are lowered. Wood carvers earn $1.20 to $2.80 a week, and the brush makers at Gabel from $1.60 to $2 a week. The wood carvers at the Wittigtal earn $1.60 to $3.60 a week, and the wood and mat makers at Niemes from $1.20 to $1.60 a week.

People take work home with them from some of the lace factories.

Around perhaps the only table in the only room, in a little house, the family assemble, the man, his wife, the grandparents and children with other members of the family, if there be any. When evening comes on, an oil lamp, a candle, or even chips of wood are the only lights by which they can work. On Thursdays, Fridays and Saturdays the finished articles are taken to the factories and paid for.

"It is very hard now," said one of the lace exporters from Neudek the other day, "to get people in summer to make laces. They prefer to go to work in fields or picking hops, for which they get higher wages than by making laces. Children get 8 cents a day at that time and adults from 25 cents to even 40 cents, and of course we can not afford to pay such high wages for lace making."

Austria-Hungary's housing problem becomes acute in her city and factory districts. In 1900, 43 per cent. (592,134 persons) of the inhabitants of Vienna lived in houses of one room, exclusive of kitchen. In Reichenberg, a decade earlier, 57.5 per cent. of the dwellings, and in the suburbs 79.2 per cent., were without kitchens. In many of these houses the inmates did their manufacturing work. Similar conditions were found throughout the empire. Conditions in Reichenberg have not materially changed since 1890, but lately in other parts of Austria and Hungary a strong movement has set in for the erection of suitable dwellings for the poorer classes. The chief improvements are in the size of rooms, lighting, ventilation and rate of rent rather than in the number of rooms. Many of the model flats have but one room and an attic or one room and a kitchen. In some places tenants are forbidden to take lodgers. The government encourages the building of homes of a certain specified desirable type by exempting the builders from certain forms of taxation. In several cases model houses are rented at such a figure as to yield but 3 per cent. on the investment.

Italy

Italy has more than 650 mills for the manufacture of cotton fabrics. By far the larger part are in northern Italy, but the government is trying to increase the number of mills in southern Italy.

To this end land has been offered free of cost for mill sites, taxes will be remitted for ten years, and textile machinery for mills so locating will be admitted free of duty.

Labor is cheaper in the south, but it is also less efficient and mills are there farther from their sources of supply. The number of mills in the south may, however, be expected to increase. Wages in the

south range from 29.1 to 38.6 cents per day and in the north from 38.6 to 58 cents. Country mills pay much less than city mills.

The average daily wages paid in a country mill near Milan have gradually increased from 30.9 cents for men and 11.6 cents for women spinners in 1871 to 47.3 cents for men and 36.1 cents for women in 1907, while for weaving the wages have increased from 15.4 cents to 39.6 cents in the same period. The hours of labor have also been decreased from twelve to ten and a half per day. The number of days worked per year is about 290.

Some mills still run eleven hours per day.

Two of the several Italian strikes of 1907 will be described for the sake of their interesting data concerning grievances and wages.

Soanzo (*Bergamo*).—On March 9 there was initiated a strike at the weaving plant of Carlo Caprotti by 3 men and 198 women weavers making 31 cents a day, 46 girls running cop winders at 16 cents a day, 50 spoolers at 21 cents a day, 12 warpers at 29 cents a day, and 16 drawing-in hands at 35 cents a day. The weavers demanded that the fortnightly minimum requirements be reduced by one piece of cloth, the cop winders, spoolers and warpers asked an increase in wages. Fourteen men remained employed until the fourteenth at 39 cents a day, and 20 boys at 19 cents a day. The strikers, notwithstanding they were not organized, were assisted by the Catholic Society of Labor of Bergamo. They obtained a reduction of the minimum required and also a concession that loom stoppage not by their fault be not counted. The increase of wages will be settled by an arbitrator. The work began again on March 16.

Leghorn.—The firm Cantoni-Coats for the manufacture of sewing thread gives work to 250 men at 58 cents and to 950 women at 23 cents per eleven-hour day. The firm wishing to introduce in the several branches "lustraggio and tavelle" (glazing and roughing), a system of labor that meant a reduction of wages, the whole body of operatives on July 8 initiated a strike, asking a general increase of wages. The labor union of Lucca directed the strike, the president of the local chamber of commerce intervened, and the firm granted an increase of 5.8 cents per day during apprenticeship and of 2.9 cents for those on the roughening work, and besides made a formal promise for a general increase of the rate remuneration. On July 29 work was resumed. During the strike $4,053 was expended in assistance to the strikers.

Italy, in 1902, passed a law to take effect in 1907, prohibiting the night work of women and children in mills. As women and children constitute two thirds to three fourths of the operatives, the law practically meant that the mills had to be doubled. Most of the mills were prepared for the change by 1907.

Italian operatives necessarily live cheaply. In Piedmont and Lombardy the regular menu is: breakfast—bread and milk mush; dinner—spaghetti (potatoes and milk mixed into a porridge), polenta (cornmeal mush), and wine; supper—cold spaghetti porridge, cold polenta, cheese and some wine. Dinner in the middle of the day is the heartiest meal, and enough spaghetti porridge and polenta are then made up to last for both dinner and supper, being eaten cold for the latter meal. Chestnuts are also a staple article of food, and radishes, with olive oil and other vegetables, when procurable. Wine is within the reach of all.

The better class of table wine costs 7⅓ cents per quart, and less in bulk. There has been a notable increase in the consumption of meat in the kingdom. At Genoa the consumption of meat has increased 50 per cent. in fifteen years; at Milan, 50 per cent. in seven years; at Rome about 10 per cent. in seven years. At Naples, since 1902, the number of beeves slaughtered has increased 150 per cent. At Milan the number of horses slaughtered in 1897 was 4,586, in 1907, 7,132. Horse meat retails at 6 to 9 cents per pound. The per capita consumption of meat ranges from 8.8 pounds per year in the extreme south to 163.43 pounds in the province of Milan.

Coral manufacture is an important industry in Naples. The coral is sorted, cut in pieces, filed or engraved, and polished. Women do the less skilled work and receive from 40 to 60 cents a day. Men receive from 60 cents to $1.20. Very skilled engravers receive relatively high wages, but rarely as much as $3 a day.

A consul at Messina, commenting upon the effects of emigration, said that prices of both labor and foodstuffs had been raised, but that the standard of living of the laborer had become markedly higher. A part of this result was attributed to the money sent back by persons working in the United States. Italians who return from the United States are a disturbing factor, as they do not return to their old standard of living and they make those about them discontented with their lot.

Italian farmers are accustomed to intensive work. They make expert truck gardeners and vineyard tenders.

The state, voluntary organizations, and, to some extent, religious societies have been doing an increasing amount of progressive and intelligent social work in Italy. Already the effects of this work are becoming apparent.

SWITZERLAND

Swiss manufacturers have several difficulties to combat. There is such a scarcity of workmen that Italians, Germans and Austrians are imported. No night work is allowed, while in Italy *men* can work at night. Many mills are in places difficult of access, thus making the cost of transportation high. All coal and almost all machinery must be imported. In spite of these difficulties considerable manufacturing is done.

The Swiss are patient, industrious workers, and however small their wages they always contrive to have an account at the savings bank. In the country their diet seems to be coffee, bread and potatoes three times a day, with meat and wine on Sundays.

The standard of living of the workmen in the cotton mills can be judged by comparing the wages paid with the prices of food. The following table presents the data for four separate mills.

In but one mill would a day's wages purchase so much as four

WAGES PAID

	I.	II.	III.	IV.
Blow room:				
Head man			$1.06	$ .74
Workman	$ .65	$ .59	.60	.53
Waste man	.61	.55	.56	.56
Cards:				
Head man	1.42	.85	1.16	1.12
Card grinder	.77	.67	.62	.66
Can boys	.61	.51	.59	.51
Lap carrier	.60	.51	.54	.53
Oiler				.42
Draw-frame girls	.48	.43	.41	.40
Speeders:				
Head man	1.22	.85	1.06	1.10
Oiler	.61		.64	.49
Speeder hands	.65	.50	.45	.55
Creelers			.35	.39
Ring spinning:				
Head man	1.14	1.07	.87	1.16
Oiler	.61	.61	.67	.44
Spinner	.56	.31	.43	.43
Doffer			.31	.33
Machine shop:				
Head man	1.62	1.22	1.72	
Average per day	.63	.50	.47	.51

PRICES OF NECESSARIES

	I.	II.	III.	IV.
	Cents	Cents	Cents	Cents
Bread, average quality, one pound	3.13	2.95	2.63	2.95
Meat, one pound	15.68	14.77	13.09	16.59
Flour, one pound	4.4	3.5	4.31	4.31
Potatoes, one pound	.72	.72	.9	.9
Sugar, one pound	4.8	8.09	4.8	6.09
Coffee, one pound	20	28.5	19.3	15.77
Salt, one pound	1.27	1.86	.9	1
Milk, one quart	3.9	4.1	3.7	3.9
Kerosene, one quart	3.5	8.5	4.1	4.2
Beer, one quart	7.7	6.3	5.7	6.7

pounds of meat and in two cases more than four days' wages were required to pay for a fifty-pound sack of flour. Those whose wages were below the average—and they are the large majority—would fare worse.

Of the 2,000 people employed by the Maschinenfabrik Oerlikon, Zurich, 50 per cent. represent a floating force. An increasing tendency in workmen to float about is causing an increase in wages, but wages in Switzerland in machine shops are not so high as in Berlin. A good tool man at Oerlikon receives 96 cents to $1.35 per day. Fitters of the best class receive $1.35 to $1.544 per day; shop men, for varied sorts of work, 77.2 cents to 96 cents per day. The cost of living for workmen in Zurich in proportion to the cost in America is, roughly, in the ratio of about 1 to 2½ or 3. The Oerlikon firm provides both breakfast and dinner for such employees as choose to purchase them. Dinner costs about 10 cents and generally consists of good soup, pork and beef, cabbage, potatoes, and bread and butter. All except soup is served out in portions. For breakfast milk and coffee, bread and butter are provided,

and the firm pays one half. The reason for serving breakfast is to insure that the men start work in the morning on nourishing food. Baths, including soap and towel, are provided at 2 cents.

The Swiss Locomotive and Machinery Works, Winterthur, are undertaking a limited amount of welfare work. About fifty families are housed in neat dwellings owned by the company. The rent varies from $41.68 per year for three rooms to $57.90 for four rooms of medium size and $69.48 for four large rooms. Nearly all of the men residing in these houses are members of the firm's fire brigade. Baths are provided here as at Oerlikon. In general, Europe has made considerable advancement in providing houses, meals, baths, and pensions for workingmen.

Germany

Berlin workmen in machine shops obtain, as a rule, better wages than those in other parts of the empire, and the Berlin workmen are unexcelled at their respective trades. In the machine-tool plant of the Ludwig Loewe A. G. Works, at Berlin, the workmen can usually make on piece work 20.23 cents per hour. The lowest guaranteed wage is 12.614 cents per hour. Workmen can obtain houses of one room and a kitchen at an annual rental of $57.12 to $64.26 and houses of two rooms and a kitchen at $119.96 to $134.24. In the Hohenzollern A. G. Locomotive Works, Grafenberg-Düsseldorf, and the Hanover Locomotive Works, respectively, expert workmen receive, on the average, 16.6 cents per hour. The Hanover works own about 150 houses which rent at an average of $3.57 per month—a sum merely sufficient to keep them in repair. The houses contain from four to six rooms and may be occupied by one or two families. In many cases one room and a kitchen suffice, but two rooms and a kitchen are more common. The Benrather Works, at Benrath, board and lodge their unmarried workmen for 23.8 cents per day.

In the textile industries lower wages are paid than in the machine shops. Barmen is a great center for textile industries. Wages average 80 cents per day, but are increasing. Weavers on special work get as high as $1.43 a day. In the most important single cotton mill in Germany, at Augsburg, Bavaria, the picker-room hands and the carders get 50 to 70 cents a day. On two 900 self-actor mules the spinner averages about 90 cents a day, the piecer 71 cents, and each of the two creelers 35 cents. Weavers, on an average, run three looms apiece and make about 80 cents a day. The term of apprenticeship is two years, during the first six months of which 24 cents a day is usually paid. Houses of three rooms rent for $23.80 to $33.32 a year. The working day is ten hours. Wages in the mills in Saxony are distressingly low. At Plauen, Saxony, overseers receive $5.71 to $9.52 a week, rarely more. Operatives average $3.81 a week. Man, wife and several children live on this wage, although the wife is sometimes a wage earner. Rent of

the two-roomed houses is rarely less than $2.38 and is usually about $3.57 a month. The chief food is potatoes and salt, bread, and a pepper soup made of water, bread, a little fat, and plenty of pepper. Meat is rarely eaten, and when indulged in is usually in the form of soup meat or sausage.

Operatives generally eat five times a day, and rye bread is nearly always taken. The first breakfast consists of coffee, made chiefly of roasted grain, and a piece of bread or roll. Sometimes a bowl of hot water with a little flour stirred in is taken instead of coffee. The dinner is at midday. The morning, afternoon and evening meals are much lighter, and in them beer often occupies a place.

A spinning master, in the woolen mills at Aix-la-Chapelle, receives $9 to $14 per week; operatives, $5 to $6; other help, mostly girls, $4.50 to $5; weaving master, $9 to $14; regulators or setters, $7 to $10.50; weavers, $6 to $8.40; head darner, $8 to $10; head darner's assistants, $5 to $7. Prices of food, clothing and fuel in Aix-la-Chapelle are: beefsteak, per pound, 27 to 30 cents; other beef, 20 to 25 cents; ham, 40 to 55 cents; sausage, 10 to 30 cents; pork, 20 to 25 cents; horse, 10 to 12 cents; flour, 3 to 6 cents; potatoes, 1 to 2 cents; dried Bosian prunes, 6 to 8 cents; California prunes, 15 to 18 cents; cheese, 10 to 30 cents; butter, 10 to 40 cents; white bread, 4 to 6 cents; black rye bread (4 lbs.), 12 to 14 cents; workmen's shoes, $1.25 to $2.25; workmen's suits, $1.50 to $2.00; workmen's dress suit, $3.00 to $8.00; coal (per 100 lbs.), 40 to 55 cents.

More than 25 per cent. of the factory operatives of Aix-la-Chapelle have their homes in Holland, whence they come each morning (some as far as thirty miles) and return each evening. For this they pay 75 cents a week for the "workmen's railroad ticket." They mostly own little houses with one fourth to one acre of garden or field. They have a cow and a few pigs or keep some goats, and bake their own bread. They are allowed a few days off each year to till their fields. They manage to live very cheaply; a family of father, mother and four children will live on 60 cents a day. Flour is 20 per cent. and meat 25 per cent. cheaper in Holland than in Aix-la-Chapelle. Most of these country home dwellers have a savings-bank account or deposit of a few hundred dollars.

Another 15 per cent. of the workers live in adjoining German villages where they either own little fields or pay $12 to $14 rent per year. In the city a two-room house rents at $4 to $6 per month.

Twenty-five per cent. of the glass grinders in Bavaria work more than eleven hours per day. In the Breslau district 58 per cent. of the glass-grinders work from ten to eleven hours per day. Japan has become such a keen competitor in the glass industry that Germany fears opposition if a law limiting the hours of labor be passed.

The manufacture of dolls is a business of no small dimensions in Germany. In the doll factories the minimum weekly wages are: Male adults, $2.85; male minors, 95 cents; female adults, $1.80; female minors, 85 cents and the maximum wages are less than double these, being $4.75, $1.45, $3.60 and $1.55, respectively.

GENIUS AND STATURE

By CHARLES KASSEL
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THAT greatness and loftiness of stature are rarely found together is one of the leading statements of Lombroso's "Man of Genius," and the eminent Italian, in support of his assertion, arrays a respectable list of names. Nor does Lombroso stand alone in this opinion. The notion is a common one—even a proverbial one—and now and again some voice rises from press or periodical with this boding message to the stalwart sons of men.

If the biographies, however, in the average American library afford a just test of its truth, this belief must be gathered to the limbo of popular errors and delusions. So far, indeed, from supporting the statement of the great criminologist, the testimony of biography fixes the average stature of men of eminence at a point above the middle height.

In default of statistical data ready to hand—the dearth of reliable material upon this question being quite marked—the writer has turned through the biographical section of a general public library situated in the city of his residence. Of the lives of two hundred and thirty distinguished men thus examined, those of one hundred and three supplied the information sought either in exact figures or by way of general statement; and of these personages it appears that sixteen were of middle height, fifty-eight above and twenty-nine below. In many instances the stature was merely described as "medium," or above or below, and in tabulating the result we have assumed the correctness of this classification, although it is far from certain that in reality the terms bore the same meaning to all writers. Where, however, the stature was given in feet and inches, we have adopted as the standard of medium height five feet seven inches. This is manifestly too low for America, and is likewise too low for England, since, as we are told by H. H. Donaldson in "The Growth of the Brain," five hundred and seventeen observations among all classes gave 67.7 inches as the average stature for men in England. For the civilized world, however, the average would probably be so far lower than that of England and America as to make the figures we have mentioned a fair standard. Even, however, were 5 feet 8 inches to be used for middle height, the result, so far as the present paper is concerned, would not be disturbed, since none of the statures given fall within this disputed margin. It

will be observed, moreover, that our discussion is confined to the statures of men. Those of women are notoriously lower, and the two can not well be treated together in an article of short compass.

Towering above all the historic characters thus gathered before the mind's eye is the immense form of Charles Sumner with his 6 feet 4 inches. Beside him, only an inch and a half less in height, stands Thomas Jefferson, while near these two are Charles Godfrey Leland and Andrew Jackson with statures of 6 feet 2½ and 6 feet 1 inch.

Described as "over six feet" are Samuel Adams, Bismarck, Samuel P. Chase, Captain Cook, Jonathan Edwards, Eugene Field, Henry Fielding and Walt Whitman, while Charles Darwin ("about six feet"), Alexander Dumas, the elder, James Monroe ("six feet or more"), Bayard Taylor ("six feet at seventeen"), Alfred Tennyson, General Thomas and George Washington must be ranged with celebrated men six feet in height.

Another group—still of majestic presence—is referred to as "slightly under" or "a little below" six feet, and in this we find the names of Henry Ward Beecher, Rufus Choate, Sidney Lanier and Daniel O'Connell. The remainder are of less impressive height—Benjamin Franklin, Albert Gallatin, John Ruskin, Robert Louis Stevenson and Daniel Webster, who could claim five feet ten inches, General Charles George Gordon, whose stature was five feet nine inches, and Washington Irving, who was 5 feet 8½ to 9 inches.

In addition to these individuals there is a goodly company spoken of by the biographers as "tall"—Matthew Arnold, Louis Agassiz, William Cullen Bryant, Julius Cæsar, Charlemagne, Charles XII. of Sweden, Christopher Columbus, Stonewall Jackson, General Sam Houston, Leigh Hunt, Edward Fitzgerald, Ben Johnson, Chief Justice Marshall, Sir Walter Scott, Robert Southey ("very tall"), Phillips Brooks ("of great height"), Wm. M. Thackeray ("above medium height"), Patrick Henry, Lorenzo de Medici, Francis Parkman, Coventry Patmore, Peter the Great, Percy Bysshe Shelley, Sidney Smith ("of middle height, rather above than below"), Thaddeus Stevens, N. P. Willis, Richard Strauss and John Bunyan.

Described as of "medium height" are Robert Browning, John Adams, Sir Thomas More, Wm. Hazlitt, Julian, S. S. Prentiss, Lord Palmerston, Duke of Wellington, William the Silent, Sir Arthur Sullivan, Frederick the Great ("not of imposing stature"—Carlyle), Admiral Nelson ("a little man of about medium height"), Schubert ("moderately tall"), and as 5 feet 8 inches we have the names of Grant, Theodore Parker and Rossetti.

Under medium height were, according to their biographers, Admiral Farragut, who was 5 feet 6½ inches, Oliver Wendell Holmes, Paul Jones and General Phil Sheridan, each of whom was 5

feet 5 inches, Beethoven, who is described as "scarcely over 5 feet 4, Vienna measure," John Keats ("little over 5 feet"), Stephen A. Douglass ("scarcely over 5 feet") and Swinburne and Whistler, whose statures are given as "five feet or so." We should add, however, that the figures as to Swinburne and Whistler, like those with reference to Edward Fitzgerald in an earlier paragraph, were derived not from authoritative biographies, as in the case of all the other names, but from magazine articles which chanced to come under the writer's observation while pursuing these investigations.

As "short" or "under medium height" we find John Quincey Adams, Andrew Carnegie, William Ellery Channing, Chaucer, Alexander Hamilton ("much below"), Ibsen, Charles Lamb, Napoleon Bonaparte, Thomas B. Macaulay, John Milton, Thomas Moore, Alexander Pope, Robespierre, Savanarola, Wm. H. Seward ("small"), Thoreau, Martin Van Buren, Chopin and Michael Angelo.

The materialist who believes life and personality are but the florescence of physical forces, and the brain not the urn but the creative agent of thought, may rejoice over the fact that of those men of genius who were low in stature no few are expressly mentioned as having had large heads—namely, Stephen A. Douglass, Alexander Hamilton, Charles Lamb, Macaulay, Napoleon and Beethoven. On the other hand, he will be confronted by the fact that a number of tall men of a high order of talent have possessed craniums of proportions not calculated to inspire respect—notably Chief Justice Marshall, Washington, Captain Cook and, in a peculiar degree, the poet Shelley, who shared this characteristic with his fellow minstrels Byron and Keats.

The circumstance is a curious one, if our catalogue of names may be relied upon as a basis for deduction, that naval commanders have been of low stature. The fact that coast-dwellers, unlike mountain-peoples and forest-folk, are usually short in body may not be without a bearing upon this; since sea-faring men are apt to spring from coast-dwelling races.

The roll of names and statures which we have given suffers in its usefulness because of the undue predominance of American names. The effect of this is plainly to heighten the average stature. The need of a table of names, sufficiently large to obviate errors from non-essential causes, and carefully sifted so as to exclude men of merely accidental distinction, is a condition which meets the inquirer at the threshold of the subject, and even this table of names would have to be grouped by races and regions, and separately studied, in order that comparisons within each region and nationality might be made.

CERTAIN CHARACTERISTICS OF THE SOUTH AMERICANS OF TO-DAY

By Professor HIRAM BINGHAM
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UNTIL very recently, the average newspaper article and the talk of the average person, so far as it went, took it for granted that South America was a region devoted to revolutions and fevers, where individuals called South Americans spent their time in a cheerful state of anarchy. There are novels and plays that still maintain this pleasing fiction, although, thanks to a recent enlightened secretary of state and an energetic director of the Bureau of American Republics, we know much more about South America than we did. In fact, we are beginning to distinguish to a certain extent between the stable republics of Argentina and Chile and the troublesome ones like Venezuela, but we still like to speak of the people as "South Americans" and it is fair to do so.

A race is rising in South America that is different from anything that the world has yet seen. It is a hybrid product composed for the most part of the blood of Spaniards and South American aborigines, such as Quichuas, Araucanians and Abipones. There is also an infiltration of various European stocks. It is true that there are differences between the peoples of the several South American republics, just as there were great differences between the aboriginal Indian tribes. At the same time, there is so much of the blood that came from the Hispanic peninsula and this has been for so many generations the dominant factor, that it is possible to consider the people of South America more or less as a whole.

It must also be admitted at the beginning that there are many South Americans who can not be included in any general criticism. There are many families of pure Castilian ancestry who rightfully resent any implication that they are hybrids because they are South Americans. And they would also prefer not to have the pure-blooded Indians counted as South Americans, although the latter constitute a majority of the population in several republics, notably Bolivia and Peru. We ought easily to be able to appreciate the fact that such a broad term as "South American" must include many diametrically opposite types, for foreigners are finding it increasingly difficult, nay almost impossible, to define and fix the limit of our own characteristics as "Americans." A hundred years ago it was simple enough. People of English descent dominated things everywhere. To-day we are a

mixture of fifty races, and it is hard to say who has the right to be considered the typical Bostonian or New Yorker, he of English or Dutch extraction or he of Irish or Jewish ancestry.

Things are not quite so bad in South America, for most of the republics have seen but comparatively little immigration and the politics of South America are to-day directed by men of Spanish and Indian descent. Even in Argentina, where the census shows a more cosmopolitan population than in any other republic, the game of politics is controlled almost exclusively by Argentinos whose ancestors were Spaniards and Indians. In another generation this may be changed, for, thanks to an increasing and extensive immigration, the Argentine type is becoming more and more Europeanized. In Bolivia and Peru, on the other hand, owing to the scarcity of available and accessible agricultural lands and the consequent lack of immigration, the typical politician is nearer a simple cross between Spaniard and Indian. In Chile there is more Anglo-Saxon and Teutonic blood, while in Venezuela and Colombia there is very much less. In Brazil there is more African. In fact, one is almost inclined to leave the Brazilians out of the case, for their ancestors have been of a very different stock from that in the Spanish-speaking republics; Portuguese instead of Spanish, Amazonian Indian instead of mountain Indian, and far more African blood than in any other republic. Nevertheless, they too, by the very fact of their being a mixture of Caucasian, American Indian and African, living under similar geographical conditions, have many of the same traits that are found elsewhere on the continent.

Making due allowance then for the exceptions, what are the characteristics of the South Americans of to-day?

As one travels through the various South American republics, becomes acquainted with their political and social conditions, reads their literature and talks with other American travelers, there are a number of adverse criticisms that frequently arise. I shall attempt here to enumerate some of them, to account for a few, and to compare others with criticisms that were made of the people of the United States half a century ago by a distinguished English visitor.

Although it is true that the historical and geographical background of the South Americans is radically different from ours, it is also true they have many social and superficial characteristics very like those which European travelers found in the United States fifty years ago. The period of time is not accidental. The South American republics secured their independence nearly fifty years later than we did. Moreover, they have been hampered in their advancement by natural difficulties and racial antipathies much more than we have. Although the conditions of life in the United States as depicted by foreign critics seventy-five years after the battle of Yorktown, were decidedly worse than the conditions of life in South America seventy-five years after

the battle of Ayacucho, the resemblances between the faults that were found with us fifty years ago and those that are noticeable among the South Americans of to-day, are too striking to be merely coincidences. It is surely not for us to say that there is anything inherently wrong with our southern neighbors if their shortcomings are such as we ourselves had not long ago, and possibly have to-day.

The first criticism that one hears and the first one is likely to make after getting beyond the pale of official good breeding in South America, is that the manners of the ordinary South American are very bad. Let the traveler who is inclined to take such a state of affairs too seriously, read what Dickens wrote about us and our ways in 1855 in "American Notes" and "Martin Chuzzlewit." It was a faithful picture of a certain phase of American life. Furthermore, it paints a condition of affairs worse than anything seen in South America.

Travelers who are prone to find fault with the service at South American hotels and restaurants, should ponder on Dickens's description of the dining room of a New York boarding house in his day.

> In the further region of this banqueting-hall was a stove, garnished on either side with a great brass spittoon. . . . Before it, swinging himself in a rocking-chair, lounged a large gentleman with his hat on, who amused himself by spitting alternately into the spittoon on the right hand of the stove, and the spittoon on the left, and then working his way back again in the same order. A negro lad in a soiled white jacket was busily engaged in placing on the table two long rows of knives and forks, relieved at intervals by jugs of water; and as he travelled down one side of this festive board, he straightened with his dirty hands, the dirtier cloth, which was all askew, and had not been removed since breakfast.

It is indeed hard to overlook the table manners of the average South American. But how many years is it since North Americans were all reading and conning "Don't! A Guide to Good Manners"? It is less than a quarter of a century since our self-conscious use of the fork on all possible (and impossible) viands showed that we felt the need of improvement.

To one inclined to criticize the speed with which a company of South Americans will dispose of their food, let me recommend Dickens's American boarding house table where

> Very few words were spoken; and everybody seemed to eat his utmost in self-defence, as if a famine were expected to set in before breakfast-time to-morrow morning, and it had become high time to assert the first law of nature. The oysters, stewed and pickled, leaped from their capacious reservoirs, and slid by scores into the mouths of the assembly. The sharpest pickles vanished; whole cucumbers at once, like sugar-plums; and no man winked his eye. Great heaps of indigestible matter melted away as ice before the sun. It was a solemn and awful thing to see. Dyspeptic individuals bolted their food in wedges; feeding, not themselves, but broods of night-mares, who were continually standing at livery within them. Spare men, with lank and rigid cheeks, came out unsatisfied from the destruction of heavy dishes, and glared with watchful eyes upon the pastry.

The conversation of a group of young South Americans is not such as appeals to our taste. There is usually too much running criticism on the personal qualities and attractions of their women acquaintances. To them it seems doubtless most gallant. At all events, it is not sordid, as was that conversation which Dickens describes as "summed up in one word—dollars."

When Dickens visited America, he remarked the frequency of the expression, "*Yes, sir,*" and made a great deal of fun of us for our use of it. Singularly enough, the Spanish "Yes sir"—"Si senor" is so extremely common throughout South America as to attract one's attention continually.

Another thing that Dickens notices was our tendency to postpone and put off from day to day things that did not have to be done. Yet there is no more common criticism of Spanish-Americans than that known as the "Mañana" habit. You will hear almost any one who pretends to know anything at all about Spanish-America say that the great difficulty is the ease with which the Spanish-American says "Mañana." Personally, I do not agree with this criticism, for I have heard the expression very seldom in South America. It is true that it is hard to get things done as quickly as one would wish, but I believe that the criticism has been much overworked. Dickens was undoubtedly honest in reporting that the habit of postponing one's work was characteristic of the "middle west" as he saw it, but such remarks would be greatly resented to-day and would not be true.

In many South American cities one is annoyed by the continual handshaking. No matter how many times a day you meet a man, he expects you to solemnly shake hands with him just as did those western Americans who annoyed "Martin Chuzzlewit."

So also with "spitting." With others, I have been repeatedly annoyed, not only in the provinces, but also in the very highest circles of the most advanced republics, by the carelessness of South Americans in this particular, even at dinner parties. But how many years is it since "The Last American" was prophetically depicted by J. A. Mitchell as sitting amid the ruins of the national capitol with his feet on the marble rail, spitting tobacco juice? One can hardly ride in our street cars to-day without being reminded that only recently have the majority of Americans put the ban on spitting. The fact that there are already printed notices in some of the principal South American cathedrals begging people, in the name of the local "Anti-Tuberculosis Association," not to spit on the floor, shows that this unpleasant habit will undoubtedly be eradicated in considerably less than fifty years after we have ceased to offend.

We also dislike intensely the South American habit of staring at strangers and of making audible comments on ladies who happen to be passing. Unfortunately, this is a Latin habit which will be hard to

change. The South American has a racial right to look at such customs differently. But if some of his personal habits are unpleasant and even disgusting from our point of view, there is no question that we irritate him just as much as he does us. Our curt forms of address; our impatient disregard of the amenities of social intercourse; our unwillingness to pass the time of day at considerable length, and enquire, each time we see a friend, after his health and that of his family; our habit of elevating our feet and often sitting in a slouchy attitude when conversing with strangers are to him extremely distasteful and annoying. Our unwillingness to take the trouble to speak his language grammatically and our general point of view in regard to the "innate superiority" of our race, our language and our manufactures are all evidences, to his mind, of our barbarity. We care far too little for appearances. This seems to him boorish. We criticize him because he does not bathe as frequently as we do. He criticizes us because we do not show him proper respect by removing our hats when we meet him on the street.

Furthermore, he regards us as lacking in business integrity. We are too shrewd. Our standard of honor seems low to him. In fact, a practical obstacle with which one accustomed to American business methods has to contend in South America, is the extreme difficulty of securing accurate information as to a man's credit. Inquiries into the financial standing of an individual, which are regarded as a matter of course with us, are resented by the sensitive Latin temperament as a personal reflection on his honesty. It seems to be true that the South American regards the payment of his debts as a matter more closely touching his honor than we do. He is accustomed to receiving long credits; he always really intends to pay some time and he generally manages to raise installments without much difficulty. Yet when pressed hard in the courts, he is likely to turn and resent as an intentional insult the judgment which has been secured against him. I have known personally of a case where a debtor informed his creditor that it would be necessary for him to come well armed if he accompanied the sheriff in an effort to satisfy the judgment of the court, for the first man, and as many more as possible, that crossed the door of his shop on such an errand would be shot. This we criticize as defiance of the law. To the South American, the law has committed an unpardonable fault in venturing to convict him of neglecting his honorable debts.

It is unfortunate that the South Americans themselves are generally quite unaware of their failings—a species of blindness that has frequently been laid at our own doors. It is due to a similar cause. South American writers who have traveled abroad and seen enough to enable them to point out the defects of their countrymen rarely venture to do so. The South American loves praise but can not endure criti-

cism. It makes him fairly froth at the mouth, as it did the Americans in the days of Charles Dickens's first visit. So the pleasant-faced gentleman from Massachusetts, Mr. Bevan, told young Martin Chuzzlewit:

> If you have any knowledge of our literature, and can give me the name of any man, American born and bred, who has anatomized our follies as a people, and not as this or that party; and has escaped the foulest and most brutal slander, the most inveterate hatred and intolerant pursuit; it will be a strange name in my ears, believe me. In some cases, I could name to you, where a native writer has ventured on the most harmless and good-humored illustrations of our vices or defects, it has been found necessary to announce, that in a second edition the passage has been expunged, or altered, or explained away, or patched into praise.

There is a story in Santiago de Chile of a young American scholar who spent some time there studying localisms. When he returned to New York he ventured to publish honest but rather severe criticisms of society, as he saw it, in that most aristocratic of South American republics. As a result, the university from which he came received a bad name in Chile and his visit is held in such unpleasant memory that his welcome, were he to return there, would be far from friendly. This seems narrow-minded and perverse, but is exactly the way we felt not long ago toward foreigners who spent a few months in the states and wrote, for the benefit of the European public, sincere but caustic criticisms. American sensitiveness became a byword in Europe. Possibly it is growing less with us. However that may be, South American sensitiveness is no keener to-day than ours was fifty years since.

It is particularly important that we should realize that the political conditions of the larger republics are very much more stable than our newspaper- and novel-reading public are aware of. Lynchings are unheard of. Serious riots, such as some of our largest American cities have seen within the past generation, are no more common with them than with us. It is true that the Latin temperament finds it much more difficult to bow to the majesty of the law and to yield gracefully to governmental decrees than the more phlegmatic Teuton or Anglo-Saxon. But the revolutions and riots that Paris has witnessed during the past century have not kept us from a serious effort to increase our business with France. The occasional political riot that takes place, of no more significance than the riots caused by strikers with which we are all too familiar at home, is no reason why we should be afraid to endeavor to capture the South American market.

Climatic conditions and difficulties of rapid transportation have had much to do with the backwardness of the South American republics. With the progress of science, the great increase in transportation facilities and the war that is being successfully waged against tropical diseases, a change is coming about which we must be ready to meet.

There is not the slightest question that there is a great opportunity awaiting the American manufacturer and exporter when he is willing

to grasp it with intelligent persistence and determination. South America is ready to take American goods in very large quantities as soon as we are ready to take time to give attention to her needs. As Mr. Lincoln Hutchinson aptly says:

> There is no quick and easy remedy; money must be spent, thoroughly equipped export managers must be employed, export houses specializing on South American trade must be established, efficient travelers must be sent out, technical experts employed, agencies established, credits be given, minutiæ of orders attended to, and, above all, trade connections adhered to in spite of allurements of the home market, if we would succeed in the face of our competitors. Halfway measures can accomplish but little, and that only temporary.

Germany teaches her young business men Spanish or Portuguese and sends them out to learn conditions in the field. American universities long ago learned the advantage of adopting Germany's thorough-going methods of scientific research. American business men have hitherto failed to realize the importance of adopting Germany's thorough-going methods of developing foreign commerce. It is high time that they took a leaf out of the experience of the "unpractical" universities.

Finally, a word of caution to those in search of information regarding the history, politics or geography of South America. The most unfortunate result of the seven centuries during which Arab, Moorish or Mohammedan rule dominated a part or the whole of the Spanish peninsula, is the truly Oriental attitude which the Spaniard and the Spanish American maintains towards reliable information, or what we call "facts." The student of the East realizes that orientals, including Turks and celestials, have no sense of the importance of agreeing with fact. They have, furthermore, a great abhorence of a vacuum. If they do not know the reply to a question they answer at random, preferring anything to the admission of ignorance. If they do know, and have no interest in substituting something else for what they know, they give the facts. When they have no facts they give something else. They not only deceive the questioner, they actually deceive themselves. The same thing is true to a certain degree in South Americans. Sometimes I have thought they were actually too polite to say "I don't know."

In South America as in the East it is of primary importance to reach the men who know and to pay no attention to any one else. No one really knows, who is not actually on the spot, in contact with the facts. The prudent observer must avoid all evidence that is not first hand and derived from a trustworthy source.

I do not bring this as a charge against the South Americans. I state it as a condition which I have found to be nearly universally true. So far as the South Americans are concerned it is an inherited trait and one which they are endeavoring to overcome. They are not to be blamed for having it, any more than we are to be blamed for having inherited traits from our Anglo-Saxon ancestors which are unpleasant to

our Latin neighbors and for which they have to make allowance in dealing with us.

In offering these adverse criticisms of the South American as he appears to me to-day, I must beg not to be misunderstood. There are naturally many exceptions to the rule. I know personally many individuals that do not have any of the characteristics here attributed to South Americans in general. I have in mind one South American, a resident of a much despised republic, whose ancestors fought in one of the great battles of the Wars of Independence, who has as much push and energy as a veritable New York captain of industry. He has promoted a number of successful industrial enterprises. He keeps up with the times; he meddles not in politics; he enjoys such sports as hunting with hounds and riding across country. The difference between him and the New Yorker is that he speaks three or four languages where the New Yorker only speaks one or two and he has sense enough to take many holidays in the year where the New Yorker takes but few. I know another, a cultured young Chilean lawyer who gives dinner parties where the food is as good, the manners as refined, the conversation as brilliant and the intellectual enjoyment as keen as any given anywhere. He, too, speaks four languages fluently and could put to shame the average New York lawyer of his own age in the variety of topics upon which he is able to converse, not only at his ease but brilliantly and with flashes of keen wit. I know another, a distinguished historian, who has been described by a well-known American librarian, himself the member of half a dozen learned societies, as the "most scholarly and most productive" bibliographer in either North or South America.

Such men are worth cultivating. We have much to learn from them, especially of the value of polite language and courteous intercourse. At close range we may dislike some of their manners and customs, but not any more so than European critics disliked ours half a century ago. And not any more so, be it remembered, than the South American dislikes ours at the present day.

The South Americans of to-day have so many of the faults of the Americans of yesterday that all *our* dealings with them should be marked by appreciative understanding and large-minded charity. Any feeling of superiority, like that "certain condescension" which we have noted (and hated) in foreigners, will only make our task the harder, and international goodwill more difficult to achieve.

WHEN DOES A FOOD BECOME A LUXURY?

By Professor E. H. S. BAILEY
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IN the rapid expansion which is taking place in this country, and in attempting to adjust ourselves to these changed conditions, and to the higher price of foodstuffs, there is danger that we forget to differentiate as carefully as we formerly did, between a nutritious food, which is purchased for its food value, and other products, also good enough as foods, but which are sold at prices which bring them within the domain of luxuries.

In buying delicately flavored candies or chocolates at from 40 to 80 cents per pound, although it is recognized, by those who think about it, that the chocolate and sugar are excellent food material, no one buys such things *as* food. They are purchased as luxuries pure and simple, because their flavor pleases the palate. Chocolate and sugar are also sold as food, or to be used as a constituent of foods, at a price so low that they can properly be used in the preparation of foods and beverages. In this case their food value is more closely proportionate to their cost.

Although a definition is in some cases a stumbling block, we venture to say that, in case of foods, a luxury is a substance that may have some nutritive value, but which has a low food value in proportion to the cost while, on the other hand, a food has, or should have, a comparatively high food value in proportion to its cost.

Some foods are expensive on account of their rarity or because they are out of season, some because of the cost of the original material from which they are made, some because they are brought from such a distance that the transportation charges are high, and others on account of the expense attending the manufacture.

In general, manufactured foods cost more than those upon which but little labor has been bestowed to prepare them for market. This is well illustrated in the case of ordinary granulated sugar which frequently retails at five cents per pound, while (although often made from the same "stock") "cube" sugar, which has been sawn into blocks, and "powdered" sugar, which has been ground and perhaps bolted, sells at ten cents per pound. The original materials in a five-cent loaf of bread would probably not cost three cents, yet we recognize that to make the bread and bake it and deliver it to the consumer costs some-

thing, and the manufacturer is entitled to a fair profit. That profit can be saved by the consumer if he does his own manufacturing and makes his bread at home, but that means an expenditure of labor and fuel.

There are many vegetables and fruits which, on account of containing from 30 to 90 per cent. of water, have a comparatively low food value, and seem to be expensive foods. Some of them are, but on account of the vegetable acids present, or because they dilute the more concentrated foods, or are stimulating to the appetite from their variety and agreeable taste, it is everywhere conceded that they are valuable additions to the diet. If fruits are out of season and consequently expensive, the ordinary purchaser is content to wait until they are abundant and cheap. If he pays a high price for the fruits, he immediately recognizes that they are to be classed as luxuries.

Although it may with reason be said that the cold-storage industry has afforded an opportunity to hold back from market certain perishable food products, and thus keep the price up to a figure which will insure a handsome profit, this practise has extended very greatly the season in which fruits and similar products may be offered for general consumption, and in many cases it has withdrawn them from the class of luxuries.

Game and expensive fish the ordinary consumer is not tempted to buy, but when it is a question of the "cut" of beef or mutton, he sometimes says, "the best is none too good for my family," and so buys the choicest cuts, not recognizing that others of less delicate flavor would afford the same nourishment per pound, and would if properly cooked and served be appetizing and in every way satisfactory. The sirloin may be a luxury, but the consumer does not recognize it as such and consequently spends more of his wages than he can afford upon this form of nitrogenous food.

The rapid change that is taking place in the dietary of the American people, and the necessity for doing without servants, because efficient help can not be obtained, has but confirmed the tendency in every household to allow the food manufacturer to prepare the food, and thus diminish as much as possible the labor of the household. This movement applies to all articles of household use, so that all possible labor is now done outside the home. It would be useless to attempt to stem this tide, but something may be done to direct it so that it will not entirely exhaust the family resources.

The manufacturer prepares the food from more or less satisfactory "stock," and within recent years, with fair attention to the sanitary condition of the factory. It may be packed in cans or packages or boxes or cartons, and if the package is tastily put up, and the contents have an agreeable taste, the consumer does not stop to inquire whether

he is getting his money's worth or not—whether his pounds are sixteen ounces or only ten; whether he is paying at the rate of five or twenty-five cents per pound for a simple, ordinary, nutritious food. The list of foods sold in packages is constantly increasing. It includes fruits, pickles, vegetables, crackers, cakes, cereals, syrups, meats, fish, vinegar, spices, milk, cheese, butter, jams, jellies and even dried eggs. The great advantage, which all will admit, is that the package protects the food from dust and dirt and possible infection. The disadvantage is the greatly increased cost over the bulk articles.

Until the present food laws and the "weight and measure" laws were enacted, the consumer had not perhaps noticed that the "carton" had taken the place of the pound, and that this had shrunken in weight with each passing season. When the housekeeper, who was hard pressed to make her scanty allowance carry her through the week, expostulated with the grocer, in regard to the weight of his "pound" of butter, he simply said "That is the way we buy it; we do not sell the package for a pound; nobody is cheated." Decidedly some one was cheated—the consumer of course. The small housekeeper buys a bottle of vinegar for 15 cents or at the rate of 60 cents per gallon for vinegar selling in bulk at 25 or 30 cents per gallon.

One of the most conspicuous illustrations of the tendency to allow the manufacturer to reap, to say the least, a large profit, because the consumer wants to buy his food "ready prepared," is the fad of making the breakfast to a great extent of the newly invented "breakfast cereals." A few years ago the people did not know the meaning of these words, and now they are common in the most modest bill of fare.

Since these foods are made mostly from wheat, corn and oats, it is absurd to suppose that the claims of some of the manufacturers are true, when they say that these foods are in every way better than the original grains from which they are made—in fact that the process of manufacturing is a proteid-concentrating process. Analysis has shown that the amount of so-called "predigested" or "malted" material in these foods is small at most, and aside from the dextrin which is formed largely by dry heat just as bread is toasted or potatoes are browned in frying, these "malted" foods are little better than crackers or bread. It is a question, anyway, whether the normal stomach welcomes the appearance of predigested food; it is provided by nature with "apparatus and chemicals" necessary for the digestion of food, and why should the work be taken away from it?

Dismissing then the claim that these prepared foods are so much better than simply ground and partially bolted cereals, what do we pay for the finished product per pound? Are these cereals luxuries?

From the Bulletin of the Maine Agricultural Experiment Station for 1906 we quote the following cost in cents per pound for some of

these foods: Quaker oats, 3.1 cents; Nichol's pearl hominy, 4.5; Cream of Wheat, 8.8; Grape Nuts, 14.6; Shredded Whole Wheat, 15; Force, 16.5; Flaked Rice, 18.2; Granula, 27.2. To this may be added the cost of some other brands, as Quaker Corn Flakes, 13.3; Kellogg's Corn Flakes, 13.3; Maple Corn Flakes, 14.5; Post Toasties, 14.5; Grape Sugar Flakes, 17.8; Malta Vita, 18.4; Sugar Corn Flakes, 20; Holland Rusk, 22.8; Puffed Wheat, 29.1 cents. At this rate *a bushel of wheat* which might be originally worth $1.00 would, when made into a breakfast food, cost the housekeeper from $5.00 to $12.00, calculating that 75 per cent. of the grain is available as food, as is the case in making wheat flour. Oatmeal in bulk sells at five cents a pound, and simple preparations of the other grains at from five to seven cents.

These are a few of the illustrations to show "where the money goes," or at least some of it, expended in the ordinary household. Some of us are living on the luxuries of the market, and use them as food to furnish the proteids and carbohydrates and fat for daily consumption. Instead of using the oak and maple and pine for fuel, we are feeding the fire with mahogany, and circassian walnut and rare imported woods.

THE PALEONTOLOGIC RECORD

THE BIRTHPLACE OF MAN

By Professor S. W. Williston
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VARIOUS writers, from Le Conte to Smith Woodward, have spoken of critical or rhythmical periods in evolution, periods when evolutionary forces have acted more vigorously than at others, with intervals of relative quiescence. What these forces are and have been we are not yet sure, whether extrinsic, that is, environmental or Lamarckian, or intrinsic, that is, orthogenetic, teleological or what not. Perhaps we shall sometime be more certain of the basal causes of evolution, for the paleontologist at least is not satisfied with the crass ignorance of our Weismannian friends who impute the beginning of all things to mere chance. Perhaps when we do know these fundamental causes we shall understand better why evolution has been rhythmical, if such was really the case, as some of us believe with Woodward.

But, whether there have been internal forces which have had chiefly to do with the rhythm of evolution, or whether such critical periods in the evolution of organic life have been due solely to the larger cosmic forces, I think we shall all admit that there have been critical places of organic evolution, places upon the earth where evolution has advanced with more rapid pace than in others, places perhaps where environmental conditions have conspired to hasten the development of life, or of particular groups, classes or kingdoms of life.

Such a critical period, at least for the higher organisms, it seems to me, was the early Pliocene; such a critical place was central Asia; and both together resulted in the birth of man.

It is a curious fact that nearly all our domestic animals had their origin in Asia. It is also a curious fact that the domestic animals are, almost without exception, the crowning ends of their respective lines of descent, the most highly specialized of their kinds. The genus *Bos*, the most highly developed of the even-toed ungulates began, to the best of our present knowledge, in the Lower Pliocene of India. And its four distinctive types likewise first appeared there: the *Bubalus* group, including the domestic buffalo of India, and its untamable kin of Africa; the group that is represented by the domesticated humped oxen of India and their wild relatives of Africa; the bison strain which spread in Pleistocene times almost to the remote corners of the earth;

and the true oxen, the most useful of all creatures to man, which spread to Europe as *Bos primigenius,* the ancestor of *Bos taurus.*

The sheep also found their expression point in India, and their home to-day is central Asia. So too the domestic goat yet lives wild in western Asia, a less plastic type, but purely Asiatic in origin. Indeed, of the whole family of Bovidæ, Asia was the origin and dispersal center, and it is a curious fact that it still remains the home of the higher types while others of lower degree have wandered afar to find their homes in Africa, Europe and America. The camelids after long ages of exclusive development in North America migrated to Asia to find their highest evolution in the true camels, the highest and probably final stage in the evolution of the family, while their kin, of lower degree, went southward to terminate in the llama and alpaca, the only mammals among all man's servants which we can say with tolerable certainty have been entirely beyond the influence, direct or indirect, of Asiatic environment. The reindeer, the highest of all the cervid family, doubtless arose in northern Asia; certainly its home is in part there, though some of its early kin migrated to America and have left their descendants in the caribous. And India was the birthplace, as it is the home, of the pig, whence came originally our domesticated swine. Whether or not we give to *Sus* the highest place among the non-ruminant, even-toed ungulate mammals, or to the Babirussa, matters not, for both are of Asiatic origin.

Of the odd-toed ungulates our domestic horse, *Equus caballus,* stands on the very summit; and *Equus caballus* arose in Asia, where its ancestors yet have their wild progeny. And I believe that eventually we must give to Asia the honor of the birthplace of the genus itself. And the next lower type of the Equidæ, the asses, are of Asiatic ancestry, though our domestic species comes from Arabia and Africa, while the most primitive of the horses yet living found their refuge in Africa.

Southern or central Asia was the birthplace in early Pliocene times of the elephants, and was their dispersal center; and, in *Elephas indicus,* the only domesticated species, we have the last and highest stage in the evolution of the Proboscidea, and, as is the case with the cape buffalo, the zebras, wart hogs and others, we find in Africa their only living kin, of more primitive form and untamable.

Of all the great order of Carnivora the genus *Felis* admittedly occupies the highest place. The home of the cats is southern Asia and there doubtless was their birthplace and the center of their dispersal. The known paleontological record of the true cats is very meager indeed, and doubtless always will be till we know more of the Pliocene and Pleistocene faunas of Asia. Two of the domesticated cats, the Siamese and the cheetah, are of immediate Asiatic origin, and our fire-

side pet, while coming from northern Africa, doubtless arose from Asiatic forebears in Pliocene or Pleistocene times. What the origin of the various strains of dogs was we know not, though the wild forms most nearly allied are living in Asia to-day, and the greyhound and mastiff almost surely were domesticated in Africa thousands of years ago. I believe that we may safely give to Asia the honor of the birthplace of most of the domesticated species in Pliocene or Pleistocene times.

Nor does it seem that this remarkable evolutional acceleration during Pliocene times in central Asia was confined to the mammals alone. The ostrich, the highest type of ratite birds, arose in central Asia. The jungle fowl, the highest of the gallinaceous birds and the ancestral stock of our most valued domestic fowls, arose in India and is still at home there. The peacock is exclusively Asiatic; the gray goose, the parent of our domestic geese, has its home in part at least in Asia; and the same may be said of the ancestors of the domestic doves; while the domestic duck may have originated there for aught we yet know. The guinea fowls only are exclusively African, and the turkey American.

Of the reptiles I will venture to say less. But is it not a significant fact that the highest specialization of the reptilian class appeared during Pliocene times in the gigantic extinct gavials of central Asia? Certainly the cobra is entitled to a high but unenviable distinction among the snakes. And *Megalobatrachus,* the largest of all recent amphibians, lives in Japan and China. Finally, of the domestic plants by far the majority come directly or indirectly from the Asiatic flora.

Have all these and doubtless many other facts of their kind no significance? Has man been an exception among so many branches of vertebrate evolution? The common inference has been that so many of our domesticated animals and plants come from India because man first reached civilization there, but the inference is, I believe, quite unjustifiable. Man was born and attained elemental civilization in Asia because there was the place of all others upon the earth where evolution in general of organic life reached its highest development in late Cenozoic times. No mammals and few other creatures have been domesticated by man in thousands of years, for the simple reason that he had eliminated all but the most advanced and most adaptable long before, and none were left to compete with them.

That man originated in the western continent is quite impossible. There is not a particle of evidence in support of such an hypothesis, for there is no evidence that either man or any of his ancestry ever inhabited the western continent till late in Pleistocene times. Indeed, so far as North America is concerned, there is much to justify the assertion that the Pliocene and Pleistocene were a period of evolutional depression here, of relative quiescence when the rhinoceroses, tapirs,

and later the camels and horses, found conditions uncongenial and migrated to Asia, a more favored region.

It has often been assumed that man must have originated in a warm or tropical climate, to account for the loss of his hairy covering. But I quite agree with Dr. Matthew, that the loss of hair is almost conclusive evidence of his origin in a temperate or cold climate where he found clothing necessary to protect himself from the inclemencies of the weather. We know of no mammals or birds losing their pelage or plumage because of tropical conditions, though some may have lost their hair because of vermin.

Taking all these facts and conclusions into consideration it seems to me that such evidence as paleontology can at the present time offer points toward central Asia as the birthplace of *Homo,* and that the time of his origin, as a family, was late Miocene or early Pliocene. If *Pithecanthropus* be really a true hominid, then we already have evidence of his origin in the Asiatic region. Be it as it may, I confidently believe that within a very few years the discovery of indubitable links in man's ancestry will be made in central Asia, in China or northern India. Perhaps to no region of the world does the paleontologist look with more eager expectation for the solution of many profound problems in the phylogenies and migrations of the mammals than to central and eastern Asia. That there are remains of many extinct vertebrates awaiting discovery there in the late Tertiary and Pleistocene deposits has been made evident by the many fragments brought to light by explorers and travelers.

A field second to none other in the importance and richness of the results to be expected awaits the paleontologist in Asia.

THE RELATION OF PALEONTOLOGY TO THE HISTORY OF MAN, WITH PARTICULAR REFERENCE TO THE AMERICAN PROBLEM

By Professor JOHN C. MERRIAM
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CONSIDERED in its broadest aspect, the most important relation of paleontology to the study of man concerns the support which it gives to the general theory of evolution of the organic world. If it be held that we have reason to believe man, with all his highest qualities, a product of evolution out of so-called lower animal types, then it becomes necessary to have a full knowledge of the history of man and of the forms preceding him, in order to understand the origin and the true nature of man's fundamental characteristics as they exist to-day. On the other hand, if there is reason to believe that man as

represented in his highest attributes is entirely apart from nature, the importance of paleontology, as offering a part of the explanation of the fundamental characteristics of man, is very greatly diminished. The value of paleontology would then lie largely in an interpretation of the setting or environment in which man is developing.

With these considerations in mind, it appears of the greatest importance for us to obtain as full a history of the organic world, and as satisfactory an interpretation of the processes therein concerned, as it is possible to secure. Particularly is it desirable to have before us a clear statement of that portion of the paleontological record which leads from the higher vertebrates through the primate division to man.

One of the important phases of general paleontological work which must receive special attention is the early history of the primate order with particular reference to the development of those characteristics which are most prominent in the human family. We have, as yet, accumulated too little evidence in this field. Among the characters which must be followed would be (1) extraordinary brain development, (2) the tendency to development of an upright position, (3) the freeing of the anterior limbs from the work of locomotion and the development in them of extraordinary adaptability. Whatever other interests one may have, there is certainly no more alluring problem than tracing from the primitive mammalia into the early primate those peculiar characters through which later on primitive man began the process of making nature subservient to himself. We may never know whether the brain actually grew large first and requisitioned the hands, so that the animal became bipedal and therefore finally erect in position, or whether a tendency to erect position was directed by the frequent assuming of a vertical position in a tree-climbing ancestor; but it is not beyond reason to presume that a thoroughly satisfactory paleontological record might give us an explanation of the origin of these characters.

The later primate history, or that which leads directly to the human type, is also unfortunately incomplete, though most remarkable advances have been made in the last few years. More missing links have already been furnished than science was supposed to require a few decades ago, but we can hardly be said to have one tenth of the material that it is desirable to have in order to show the transition from anthropoid to human, or from pithecanthropoid to the type of Spy or Neanderthal. European paleontologists are at the present time making rapid strides in filling the gaps of that portion of our ancestral chain which falls in the Quaternary system, and we may look for other important discoveries within the next decade.

It is to be presumed that the greater part of the work on the late Tertiary and Quaternary history of man will be carried on in the old world. The writer sees no reason why in this important work Amer-

ican paleontologists should not interest themselves to some extent in investigations now in progress in Europe and Asia, just as American archeologists have contributed to the success of work on the later history of man. Whether American paleontologsits, working in their own field, are to have a part in interpreting the Pleistocene history of man is a burning question at the present time.

Whether we find that man was in North America in Pleistocene time or not, it is certainly true that one of the most important problems in the general history of the human race concerns the date of occupation of the western hemisphere by the human family. Discussion of the numerous finds reported to represent Pleistocene man in North America are too well known to every one to require particular mention. It should only be noted in passing, that as yet no specimens representing either skeletal remains or implements of man found in North America are generally recognized by geologists and paleontologists as of Pleistocene age. A careful search through the literature, and the investigation of many of the actual occurrences, lead the writer to the conclusion that we have, as yet, nothing in North America which can be considered as unquestionably representing Pleistocene man.

Also in South America there has been serious discussion of many interesting finds. The evidence on the whole seems to be more distinctly in favor of Pleistocene occupation there than is the case in North America. The discoveries made in recent years in the cave at Last Hope Inlet, and the numerous remains found in the Pampean formation at levels very far below the surface, seem difficult to interpret excepting on the supposition that man was present in South America before the beginning of the recent epoch.

It is to be presumed that any occupation of South America would necessarily be through migration by way of the northern continent, and proof of the presence of man in South America in Pleistocene time would be tantamount to proof that he was in North America at least as early. This suggestion does not, of course, take into account the theories of Ameghino to the effect that man is possibly derived from some of the South American monkey forms. Another suggestion made by Ameghino would give us an immigration of old world forms, possibly with ancestral man, coming into the southern continent in comparatively late time, by some other route than North America.

In the consideration of man's history in America, it is particularly important to notice the probable relation of migrations of the human family to migrations of other groups of mammals. The presumption is that the migrations of primitive man were caused or occasioned largely by influences of the same sort as have produced the spreading out or migration of many other mammalian types. It becomes then particularly necessary to discover exactly when the more recent migra-

tions of mammals into the North American continent have taken place, and, so far as possible, the exact routes of migration. This problem is in a large part paleontological, requiring for its interpretation a satisfactory account of the paleontology of vertebrates, invertebrates and plants of North America and of Asia, with particular reference to the relations of adjacent areas. We must also have, associated with this information, a full statement of the crustal movements in these regions as interpreted by the stratigraphic geologists and the physiographers.

Through the accumulated efforts of paleontologists in this country particularly, we have already a considerable mass of evidence bearing on the general relationships of the faunas of North America and Asia in comparatively recent geological time, but the detail of the problem is, as yet, scarcely indicated. Particularly for Pleistocene and Pliocene time our knowledge of the faunal succession is exceedingly meager, and we can scarcely expect to know anything satisfactorily until the Pleistocene mammalian paleontology of America has been worked out in detail. This work must be followed or accompanied by similar studies of the mammalian faunas of western and southern Asia. When this is completed we shall know the time of the various migratory movements, the nature of the faunas which migrated, the character of the land areas over which they have passed, and the climatic conditions which obtained along the routes of migration. The presumption is, that when this is done we shall have actual evidence of the time of man's occupation of North America.

Viewed in the large, and without regard to the detail which has just been indicated, it seems possible to present several reasonable conclusions with reference to the probable period of migration of man to America. It is shown by study of a map of linguistic stocks of the western hemisphere that the northern and southern continents taken together may be divided into between one hundred and two hundred provinces, based on the number of stocks represented. These languages vary greatly in their structure, and are not similar to the languages of other parts of the world. There is every reason to believe that a large percentage of them have been developed by linguistic differentiation which occurred since man first occupied this continent, and that measured in years the time required for this differentiation has been long. On the other hand, considering the American continent as a whole, we find that the greatly differing physical environments are not reflected to any extent in different physical types of people occupying this region. That the human family is not exempt from physical differentiation, such as is almost universally indicated in mammals which have for some time been distributed over large areas with varying environments, is clearly shown by the map of the old world. In that region the human race is known to have been spread over a wide

area for a long period, and we find several greatly differing human physical stocks in different geographic regions, just as we find differing stocks of mammals and birds.

With the lack of physical diversity among the people of the western hemisphere, there is also noticeable a resemblance of the whole group to the people of the adjacent region of Asia. Judged by the standards of differentiation which we obtain through a study of the history of geographical distribution of other mammalian groups, we have every reason to think that the people of America are immigrants who came from the Asiatic region and spread themselves over America after the period of the first great physical differentiation of the race, and so recently that a second stage of physical differentiation has not yet had time to develop. On the other hand, the time measured in years has been long enough so that linguistic differentiation could take place.

Inasmuch as a large part of human history falls within the Quaternary period, the question naturally arises as to whether the principal migrations of man to the American continent occurred *before, during* or *after* the Glacial epoch.

As primates are naturally animals of a warm or temperate zone, it is hardly to be presumed that primitive man came to America *during* the ice age, though there is a possibility of immigration in some of the interglacial epochs. Judging from what is suggested through study of physical differentiation, it appears improbable that man came over as early as the epoch preceding the ice age. In other groups of animals spread over large areas, marked physical differentiation has ordinarily taken place in a space of time comparable to the Glacial epoch. Had man been present in America during this long period, widely differing physical types would almost certainly have developed. On the whole it seems most probable that he arrived after the end of the last division of glacial time, or very near the beginning of the present epoch. Whether his arrival is shown to have occurred just before or just after the beginning of this epoch remains to be determined.

In conclusion it seems desirable to call the attention of paleontologists once more to the important part which their work must play in obtaining the information which we need with reference to the history of man and his antecedents. Only a small beginning has been made, and the results which must come are of great importance in the large problem of man's relation to nature. It is necessary that paleontologists keep the subject before them, in order to make certain that all information bearing upon it may be recognized as it becomes available, and be given its proper place in relation to other evidence now at hand.

FIG. 1. SAVAII VIEWED FROM THE SEA.

TWO ACTIVE VOLCANOES OF THE SOUTH SEAS

By Professor HENRY E. CRAMPTON

BARNARD COLLEGE, COLUMBIA UNIVERSITY, AND THE AMERICAN MUSEUM OF NATURAL HISTORY

IN the course of a fourth journey among the islands of the Pacific Ocean, during the year 1909, the rare opportunity was presented of making an ascent of the remarkably active volcano formed about five years ago on the island of Savaii, the largest member of the Samoan group. In addition, during a short stay in the Hawaiian Islands, a visit was made to Kilauea, a volcano which in contrast with the former, has a long geological history, for records of its intermittent periods of activity cover more than a century. It is the purpose of the present article to give a short general description of these two volcanoes.

Under any circumstances such works of nature would arouse the interest of a student of natural phenomena; but in my own case the opportunity to study them was valuable for additional reasons. My investigations of the distribution and evolution of the land snails of Polynesia demanded a thorough exploration of volcanic islands of greater age, islands that for many centuries have been sculptured by the elements so as to display alternating ridges and valleys radiating from their high central peaks. Tahiti is perhaps the most beautiful example of such an island. One finds that the several islands of the Pacific groups are of various geological ages, and consequently exhibit different degrees of weathering. They thus constitute a series showing how ancient rugged islands like Tahiti and Moorea have been derived from newly formed volcanic mountains like those of the Hawaiian and other groups, which possess relatively even sides of lava fields unfurrowed by erosion. Furthermore the various islands scattered throughout the vast areas of the Pacific Ocean are interesting to the naturalist because of the evidences they give of great changes in the level of the ocean bed, and also on account of the rôle played by corals in the construction of many types of islands. With few exceptions the islands occur in groups or chains suggesting the conclusion that they are the peaks of a range of mountains formerly connected by lowlands but now separated as the result of a subsidence of the ocean's floor. Every one is familiar with the theory that a coral atoll, consisting of a living reef bearing a more or less extensive series of coral islets, is built upon such a volcanic peak, which, according to Darwin and Dana, has been withdrawn below the water's level and overgrown by coral as it slowly subsided. It may be, as Agassiz contends, that a coral

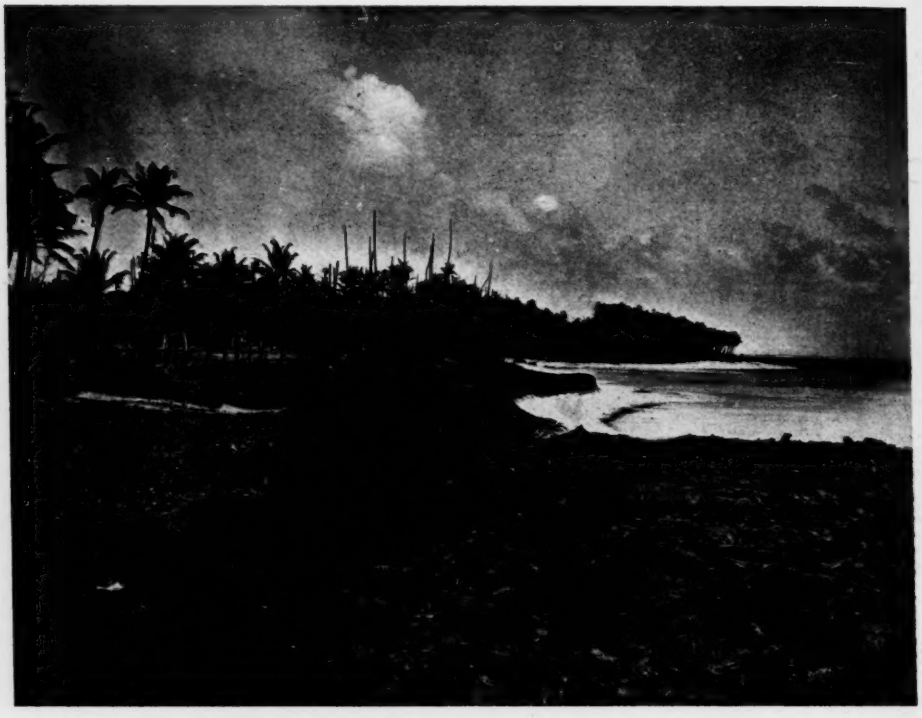


FIG. 2. WESTERN LIMIT OF THE LAVA FIELD ALONG THE SHORE.

FIG. 3. THE CONE OF SAVAII.
The cone is 400 feet from base to crest.

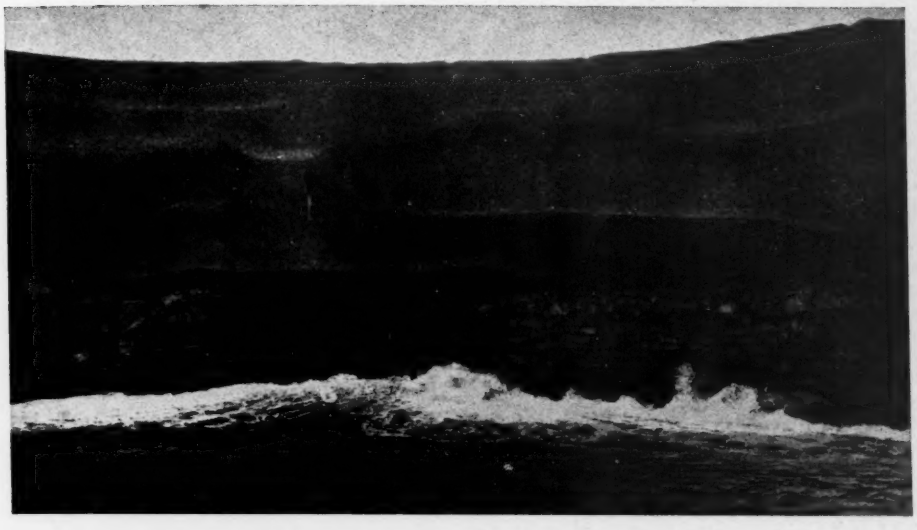


FIG. 4. SEA WALL NEAR THE CASCADES OF MOLTEN LAVA.
Cinders and lava, in superimposed layers.

FIG. 5. RUINS OF STONE HOUSES INUNDATED BY LAVA.

FIG. 6. CRATER MARGIN, SAVAII, FROM THE SEAWARD SIDE.

atoll is built upon a submarine volcanic mountain upheaved from the ocean's floor; but in either case the relation between coral reefs and volcanic peaks is one that possesses a real importance for the zoologist.

The two volcanoes of Savaii and Kilauea occur in island groups that are in every way typical of the so-called "high" islands of the Pacific Ocean. The Samoan Islands, including Savaii, lie almost on a straight line running nearly east and west. Upon examination they prove to be of various ages, for the westernmost, Savaii, bears the active volcano and displays other indications that it is more recent in origin than its neighbor, Upolu; this island, in its turn, is younger than the more rugged Tutuila and Manua to the east. The Hawaiian Islands, containing Kilauea, also range with some regularity along a line, which in this case runs west-northwest and east-southeast; but one very interesting difference consists in the fact that the newest island, Hawaii, lies at the eastern end of the group, while the relative geological ages of the other islands correspond with their serial geographical order westward to Kauai, the oldest and most sharply sculptured member of the group. In all other essential respects, the Samoan and Hawaiian Islands are closely similar. Our interest centers about the peculiar features of their two active volcanoes, and the ways in which these agree and differ.

The new volcano on the island of Savaii is assuredly the more impressive of the two. Its total mass is great, but this feature is not so striking as its remarkably rapid development in the short period of five years; this development and the continual flow of fiery lava from its vast crater entitle it to supreme place in the array of volcanoes now in activity. It lies about eleven miles back from the coast nearly opposite the middle of the north shore of Savaii, which is roughly rhomboidal in outline and forty miles long. Approaching this part of the island by day, the most striking features of the panorama are the two vast clouds of steam that rise from the places where molten lava pours in cascades into the ocean (Fig. 1). Upon the glistening black slopes beyond, jets of vapor mark the vents in the roofs of the tunnels through which the fluid lava runs upon its seaward journey from the crater; and from the crater itself, two thousand feet above sea level, rises a similar fountain of thin steam that quickly merges with the dense clouds above.

When one looks upon the enormous mass of this new mountain, it seems impossible that five years could be sufficient for its formation, yet this is actually the case. The first crater appeared in August, 1905, upon the floor of a beautiful green valley. As cinders and lava were cast forth, they gradually built up a larger dome and spread out to form the first strata of the great volcanic field. The flow followed the valley

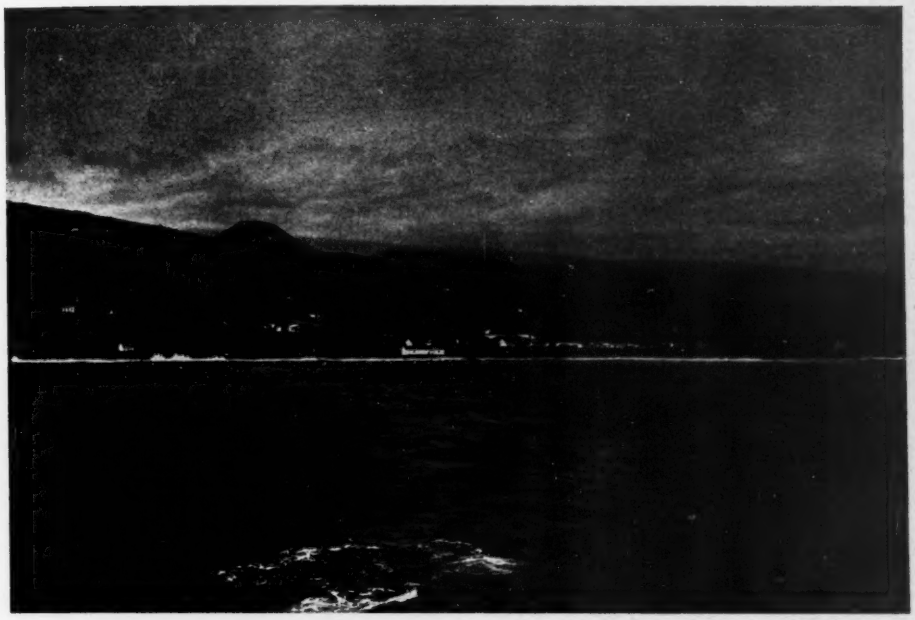


FIG. 7. MAUNA LOA, HAWAII, VIEWED FROM THE SEA.
The even slopes, bearing secondary cones, rise slowly and grandly to a high summit.

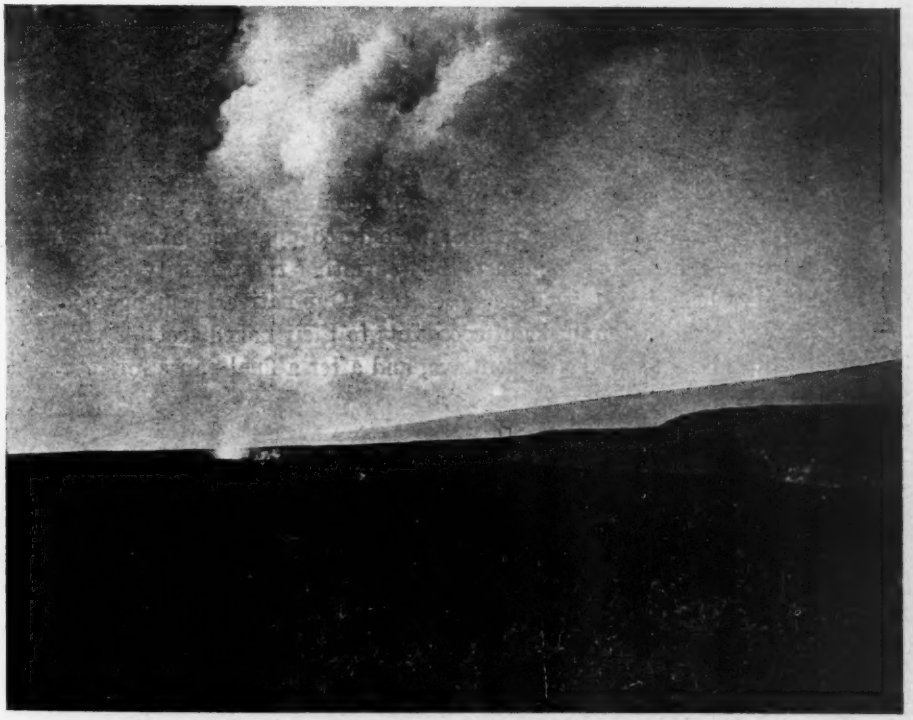


FIG. 8. LAVA-FIELD OF THE MAIN CRATER BASIN OF KILAUEA.
The jet of vapor marks the fire-pit of incandescent lava

to the ocean, but as wave after wave of fluid lava or steam-charged ash swept downward, more and more territory was devastated, while the lava, already cooled to form ridges and hillocks, diverted the later lava rivers into irregular and wider-spreading channels. Reaching the ocean, the molten rock poured into the depths of the sea over the coral reef, building ever outward, at the same time that it followed the reef and shore so as to spread laterally over a sector of the island with a shoreward arc of five miles. Naturally the seaward wall of the whole lava field is highest near its center (Fig. 4) where it measures eighty or ninety feet. This wall displays a regular series of strata of prismatic blocks or tables, formed by the cooling of successive sheets of flowing lava. These strata sometimes lie between masses of cinders, showing how the eruptive output varied in character during succeeding weeks and months. Toward either side, the whole field gradually thins out, and at its western edge (Fig. 2) it ends in a series of rough rocky billows, seared and broken by their contraction in cooling. Yet their materials reached this point as red-hot fluid lava, having traversed a route that must have been nearly fifteen miles in length.

As the molten lava swept down the valley and along the strand, its destructive effects were rapid and complete. The wooden huts of the seaside villages were entirely consumed and only where there were walls of coral limestone, like those of the churches and traders' warehouses (Fig. 5), was there anything to withstand the flood of rock. Yet so quickly did the surface of the plastic mass become cool, that the cocoanut and other trees, felled by the burning through of their bases, were rarely consumed.

We began the ascent of the volcano early in the afternoon in order to reach the crater before dusk. Proceeding through the undestroyed woods of a neighboring valley we entered upon the lava field at a point some miles from the coast, thus obviating the necessity of traversing its whole extent from sea to crater. Our natives, bearing food and water, now tied the husks of cocoanuts to their naked feet for protection in walking over the broken lava, and after a final pause for rest, we left the shade and tempered heat of the tropical forest for the open glare of the volcano's slope. Viewed from afar, this slope seems even and smooth, but in reality it is like a tempestuous ocean suddenly arrested in its movements and turned into stone. Here and there wide sheets of lava with corrugated rippling surfaces formed still rivers between massive banks of cinders through which their molten substance had earlier ploughed its way; larger and smaller tables of crust, like broken floes of the Arctic Ocean, were tilted up and piled in strange heaps. And so vitreous was the material of this sea of black broken rock that the light was reflected from millions of crystal surfaces and facets as from so many fragments of ice or glass.

Progress over this field was necessarily slow, but by following the

FIG. 9. "HALEMAUMAU," HOUSE OF PERPETUAL FIRE.

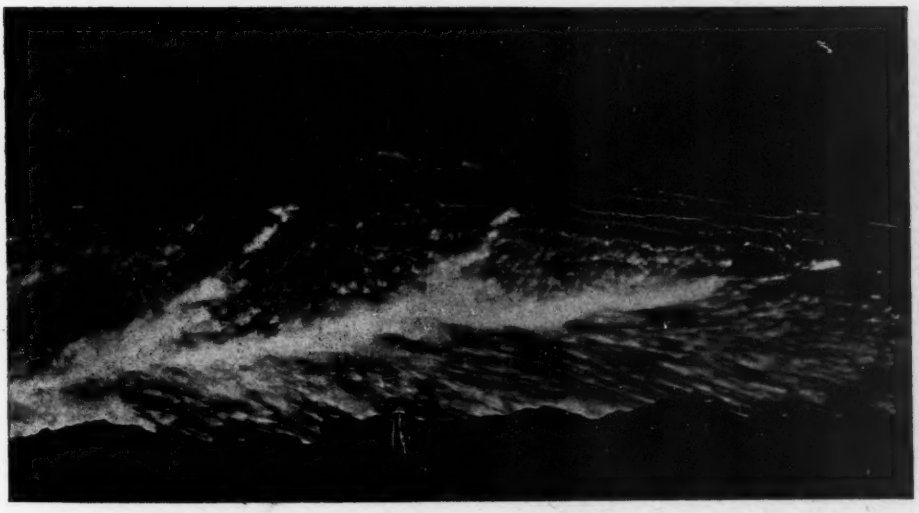


FIG. 10. THE "LAKE OF FIRE" OF KILAUEA AT NIGHT.
The photographic film was exposed four seconds.

general trend of the less broken lava streams, we gradually worked upward and inward toward the main axis of the whole lava mass, indicated by vents which gave egress to steam and gases discharged by fluid lava running through tunnels beneath the surface.

The great crater (Fig. 3) is a perfectly typical cone of cinders and lava, with a height from base to summit of four hundred feet as measured by the aneroid barometer. On three sides it is composed mainly of ashes and pumice, but toward the sea its surface displays smoother areas of rock where the lava formerly welled over the edge before the tunnels were formed by which the discharge now takes place. Large bombs, rounded masses of rock hurled from the crater during some explosive eruption, occur on the slopes, sometimes covered as by a sheet of tar with a later-extruded layer of lava (Fig. 6).

When we stood upon the extreme edge of the jagged margin and looked down upon the immense lake of fiery lava, four hundred feet below, it was hard to realize that the scene was actual and not an imaginary panorama of Dantesque infernal regions. The yawning cavity of the crater extended a full half mile in length, and its width was more than four hundred yards. Almost perpendicular and sometimes undercut, the crater walls dropped hundreds of feet to the lake of molten lava, which was in such violent commotion that it seemed to be liquid flame rather than a mass of fused and fiery rock. At certain places it boiled with greater activity, sending huge jets and fountains high into the air. Its waves moved variously at different times, but ever and again they would surge heavily to dash against the wall where the tunnels opened to give exit for the flow to the ocean. And always from this surface, thin steam-like vapor charged with acid gases swirled upward in the draught caused by the strongly-blowing trade winds, making it excessively unpleasant to look over the edge even from the windward side.

Magnificent though it was by day, the scene at night was far beyond human powers of description. With the darkness, the lake glowed almost as a continuous incandescent mass. Its light was reflected upon the clouds above, making a beacon that we had often seen from a distance of forty miles and which was said to have been visible at a distance of seventy miles during the period of the volcano's greatest activity about two years earlier. Looking seaward, the rosy vapors above the tunnel vents outlined the course of the lava down to the shore of the island where the fire of the final lava cascades gave color to two huge clouds of steam. Again and again through the night we climbed from our camp at the base of the cone to look down upon the fascinating but awful marvel, whose fires illuminated the scene so as to give ample light to guide a way over the broken lava.

Leaving now the volcano of Savaii, which is a veritable classic in its regularity of structure and mode of origin, we pass to the Hawaiian Is-

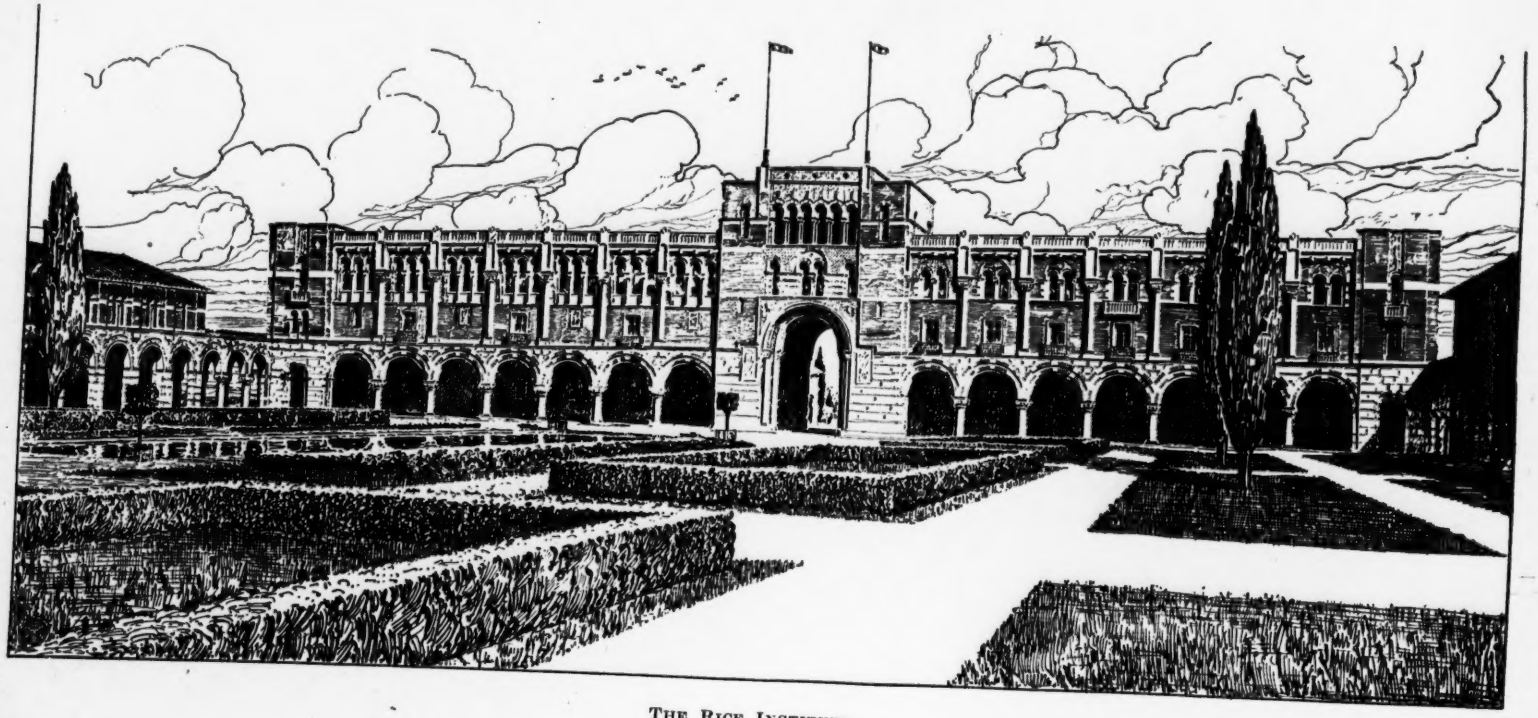
lands and the active volcano of Kilauea that is in many respects quite different from the new one of Samoa. It is an accessory outlet upon the side of the giant volcanic mountain of Mauna Loa, whose main crater at the summit, more than thirteen thousand feet above the sea, is active only at very long intervals. It is a journey of two hundred miles from Honolulu to the island of Hawaii on which Mauna Loa occurs; viewed from the ocean (Fig. 7) the even slopes of the mountain rise slowly and grandly to the high summit, bearing numerous secondary or "parasitic" cones which have been formed by sporadic local eruptions.

The first view of Kilauea itself is somewhat disappointing to one who has recently witnessed the grandeur of the eruption at Savaii, but closer acquaintance reveals many features of great interest. Kilauea lies about four thousand feet above the level of the sea, and is about twenty miles back from the coast. In general structure (Fig. 8) it is a wide shallow basin over three miles in diameter, depressed below the general level of the slopes of Mauna Loa. At quite a little distance from the geometric center of the lava field which forms the floor of this basin is the active fire-pit, marked during the day, as at Savaii, by a cloud of vapor, and at night by a pillar of fire.

The well-beaten trail to this center of activity leads down along the terraced wall of one side to the almost level floor of the main basin. In the strongest contrast to Savaii, Kilauea's lava field is remarkably even; indeed, the best areas of the former are far more broken than the most irregular parts of the latter. The surface undulates more or less, it is true, while here and there broken masses form hillocks and ridges, but the active vent has given forth the molten lava with comparative regularity. Since the middle of the nineteenth century enough rock has poured out into this wide basin to reduce the height of its vertical walls from more than eight hundred feet to about four hundred.

In December last, Kilauea was unusually active after a period of relative quiet. The fire pit (Fig. 9) is nearly circular in outline and its walls fall in two terraces to the small pool of molten lava, about two hundred feet below the natural level of the whole basin. Its general structure has varied more or less in past decades, as well as its degree of violence, but it has been a permanent center of eruptive activity for more than a hundred years, well deserving the native name of "Hale-maumau," the "House of Perpetual Fire."

Here as at Savaii the surface of the pool is in constant commotion, but the areas of incandescence are much restricted and run in parallel or forking lines. Cakes of congealed lava float between these lines, and when in their movements they reach the neighboring areas of greater activity, they are redissolved and their fragments are thrown into the air together with jets of more fluid lava. Photographs taken at night (Fig. 10) exhibit with great distinctness the major and minor areas of greater activity that form a network upon the surface of the whole pool.



THE RICE INSTITUTE.

THE PROGRESS OF SCIENCE

THE RICE INSTITUTE

In 1891 the late William M. Rice, a native of Massachusetts, who emigrated to Texas and there amassed a large fortune, selected a board of six trustees, and to them made over the sum of two hundred thousand dollars, the foundation of future philanthropies. At his further instance these trustees immediately incorporated under the name of the William M. Rice Institute, for the advancement of literature, science and art, and with the founder serving as a member of the self-perpetuating board undertook to administer the property of the institute until his death, and then—according to his wish, not before—to take up the organization of an institution of higher education open and free to the white inhabitants of Houston. When the donor died in 1900 the corporation was named as the residuary legatee of his estate; this bequest together with the original endowment and several generous gifts made during his lifetime make up the institute's present foundation of ten million dollars. Prolonged litigation established his will and the security of the foundation upon which the trustees were to begin the work of organization by placing its direction in the hands of Dr. Edgar Odell Lovett, called from the chair of astronomy at Princeton University. The task at hand was the planning of a non-sectarian institution which should look toward embracing eventually all the functions and activities of a university, but in which at the outset the interests of science should predominate; on the instructional side there was to be no upper limit, the lower limit being defined by the necessity of articulating with the best public high schools and preparatory schools of the south and the southwest; upon the investigational side where emphasis was to be laid, the direction of research in pure science and its applications was to be taken from the problems of material development peculiar to the south, commercial, industrial and agricultural; laboratories of biology, physics, chemistry, besides their use for purposes of instruction were to provide special facilities for research work by men of science, who should become identified with the institution. In effect, the terms of the charter, the will of the trustees, and every local consideration called for the establishment of a school of science, pure and applied, of university rank, wherein scientific studies were to be liberalized in an ever-increasing degree until with fuller means and ampler resources a university program, with all its complexities, might be entered upon.

By way of preparation for this work President Lovett made an extensive tour of investigation among the universities and higher educational establishments in this country and abroad, and upon his return attacked first the problem of planning a domicile worthy of the large endowment of the Rice Institute, and in keeping with its high aims and the character of its projected development. Striving to make a distinctive contribution to academic architecture in America, the trustees of the Rice Institute have boldly avowed their belief in the potency of a noble and impressive architecture as an inspiration to the youth who live and study within its shadow.

The solution of the problem was entrusted to Messrs. Cram, Goodhue and Ferguson, of Boston and New York, supervising architects of the institute,

who prepared a block plan indicating the most effective use of the three-hundred-acre campus lying along the boulevard extension of Houston's principal street, and designating the position of all future buildings; in those three comprised in the first construction—the Administration Building, the Mechanical Laboratory and the Power House—the architects have suggested a style of treatment which will be reflected in all future construction. This style is not one easy to characterize, for in it are borrowings from many southern types; reminiscent of the medieval work of Italy, southern France and northern Spain, the influence of the east and the new world's Spanish missions is not less apparent; the round Byzantine arch serves to impart a scholastic tone to the whole architecture which none the less retains a quality distinctively American and American of the southwest rather than of the north. In the blending of these southern types full advantage has been taken of local climatic conditions; bright, warm skies have prompted a freer use of color than would be hazarded in a severer climate; open courts bounded by cloister walks, while fostering an academic atmosphere, ward off the sun and give easy access to every wandering breeze from the south. Another local condition, the excellent quality of brick available had weight in the selection of a building material which would lend itself readily to the effects sought. The light pink brick of native clay seemed especially suitable to a local adaptation of the admirable brick work of northern Italy; this brick will be used, therefore, extensively and with pink Ozark marble will establish the prevailing color tone.

The Administration Building, so called because eventually its function will be the housing of the various administrative offices, will, at the outset, be put to more academic uses, and will contain besides the offices of the president, registrar and bursar, the great hall or assembly room, the library and a number of lecture halls, seminar and class rooms. Lying across the principal axis of the campus and facing the entrance from the Main Street Boulevard, the Administration Building is approached by a long driveway lined with stately trees and flanked by broad lawns. Its sallyport gives access to an inner court richly gardened and planted with cypresses, and walled in by the cloisters of surrounding buildings. As the principal building on the campus and the most conspicuous, it has been given a pronounced richness of color and finish; special pink tile matching the brick are extensively used in the face work; beneath the projecting marble cornice glazed tile of blue color form a frieze; and in the façades small shafts, columns and inlays of many colored foreign marbles discreetly accent the dominant color tone.

At some distance from the Administration Building and closing another long vista from Main Street Boulevard, the Mechanical Laboratory and the Power House, surmounted by a lofty campanile, form the extreme boundary of the proposed science group, and the nucleus for its immediate development. The laboratory itself contains on the first floor the necessary offices for professors in charge, two large laboratory rooms and a thorough system of lockers; upon the second floor two large drafting rooms and three lecture halls. Communicating with the laboratory in the rear, a large machine shop connects it with the Power House, which will supply light, heat, power and water to the entire campus.

The next construction will include two more laboratories in the planning of which, as in the Mechanical Laboratory, assistance was received from an advisory committee consisting of Professor Ames, director of the physical laboratory of Johns Hopkins University; Professor Conklin, director of the biological laboratory of Princeton University; Professor Richards, chairman

of the department of chemistry, Harvard University, and Professor Stratton, director of the National Bureau of Standards.

SCIENTIFIC MEETINGS AND SCIENTIFIC MEN IN THE MIDDLE WEST

THE National Academy of Sciences is meeting in St. Louis as this issue of the MONTHLY goes to press; the American Association for the Advancement of Science, with a number of affiliated societies, will hold its convocation week meeting in Minneapolis at the end of December. The National Academy has only once before since its foundation in 1863 held a meeting west of the Atlantic seaboard. This meeting was at Chicago in the autumn of 1903 and was fully as successful as the autumn meetings in eastern cities. The American Association for the Advancement of Science has been more national in the range of its meetings, having in 1901 gone as far west as Denver and in 1905 as far south as New Orleans. It met in St. Louis in 1903, in Madison in 1893 and in Minneapolis in 1883. Some of the affiliated societies which last year met with the association will not go to Minneapolis, there being scientific meetings in Ithaca, New Haven, Princeton and Pittsburgh. Still the number of scientific men in the middle west is now so large that a successful meeting at Minneapolis is assured. The University of Minnesota is one of the great state institutions; in recent years it has had a notable growth, and its future is assured by the immense fund which the state holds for educational purposes.

The fact that scientific men and their leaders are no longer concentrated on the eastern seaboard is indicated by the residences of the retiring and the incoming presidents of the American Association—President Jordan on the Pacific coast and Professor Michelson in Chicago. A statistical study of the origin and distribution of American men of science, recently made by the editor of this journal and published in the issues of SCIENCE for November 4 and 11, shows that the central and western states now possess a fair proportion of our leading scientific men and that they produce even more than they retain. The thousand leading scientific men of the country were selected by asking ten eminent men of science in each of twelve sciences to arrange those who had done research work in the order of the value of their work.

Of these leading scientific men there were in Boston 126, in New York 120 and in Washington 109. These three cities remain our chief scientific centers, but none the less there has been a significant westward movement in recent years. The list referred to has been made up twice, and it is possible to give the changes which have taken place in four years. In this short period the University of Chicago has gained nine men, the University of Illinois eleven and the University of Wisconsin twelve.

Even more significant is a consideration of the origin of the 238 men who have attained scientific standing between the compilation of the two lists and obtain for the first time this year a place among the thousand. Massachusetts has the highest birthrate of scientific men now as before, but it has sunk from 109 per million of its population to 85. The productivity has fallen in every one of the Atlantic states, from 47 to 36 in New York, from 42 to 17 in New Jersey from 23 to 19 in Pennsylvania and from 38 to 13 in Maryland. On the other hand, it has increased in all but one of the north central states, from 36 to 74 in Michigan, which state now stands next to Massachusetts as a center for the production of scientific men.

Most of the north central states do not as yet retain the men whom they produce. Thus twice as many have been born in Michigan, Ohio and Indiana as reside in those states. Still the

fact that in the course of four years the states of Illinois and Wisconsin have increased their scientific men of standing by 27, while New York, New Jersey and Pennsylvania have lost 23, is significant not only of what has happened but also of what is likely to happen in the course of the next two or three decades. As civilization moves westward, these great north central states may be for a time the chief scientific center of the country; and not only this, for it is quite possible that they may become the chief intellectual and artistic center of the world.

THE DISTRIBUTION OF AMERICAN MEN OF SCIENCE

THE articles referred to contain a large mass of statistics in regard to the origin and distribution of our scientific men. The 238 men who have attained scientific standing within recent years fill the places left vacant by those who have died and of those who have failed to maintain their position among the thousand. Only one foreign man of science has come to this country of such distinction that he would surely have deserved a place on the previous list, whereas ten have returned to their native countries. Six women have been added, and the total number of women on the list is 18, two of whom are among the second hundred. Those who have obtained places on the list are nearly all between 30 and 45 years of age. There are none over 55; but one over 45 reaches a place as high as the fifth hundred. Only six are under 30, and this fact seems to indicate a lack of men of genius, who as a rule demonstrate their ability at an early age.

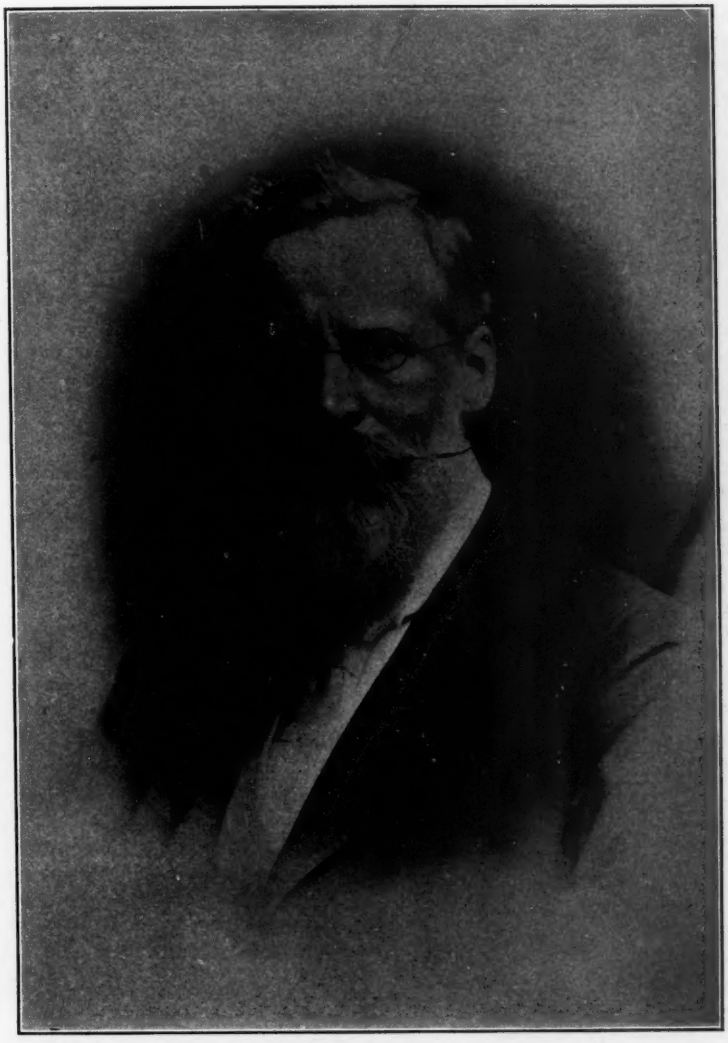
Harvard has a dominant position in the education of these men and in retaining them as instructors. It has given its bachelor's degree to 20 and its doctor's degree to 27, and 22 are on its teaching staff. Chicago stands next to Harvard, having an equal number of doctors and having 13 of the men among its instructors. Yale follows Harvard and Chicago both in regard to the men it has educated and the men it has retained. These three institutions are followed by the Johns Hopkins and Cornell in the number of degrees conferred and by Wisconsin and the Johns Hopkins in the number of instructors. The colleges of the eastern states have been less productive of scientific men than the technical schools or the colleges of the state universities.

There are 201 men still living who have failed to maintain their places among the thousand. Of these 49 reside in the state of New York. There, as in the other Atlantic states south of New England, the immense wealth appears to be unfavorable to scientific research.

The gain or loss of position of each man is known. Those under forty are likely to gain and those over this age are likely to lose. The average age of the 1,000 scientific men is 48 years; the average age of the first hundred is 54.8 years. The average age for the bachelor degree is 22.2 years and for the doctorate of philosophy, 28.4 years.

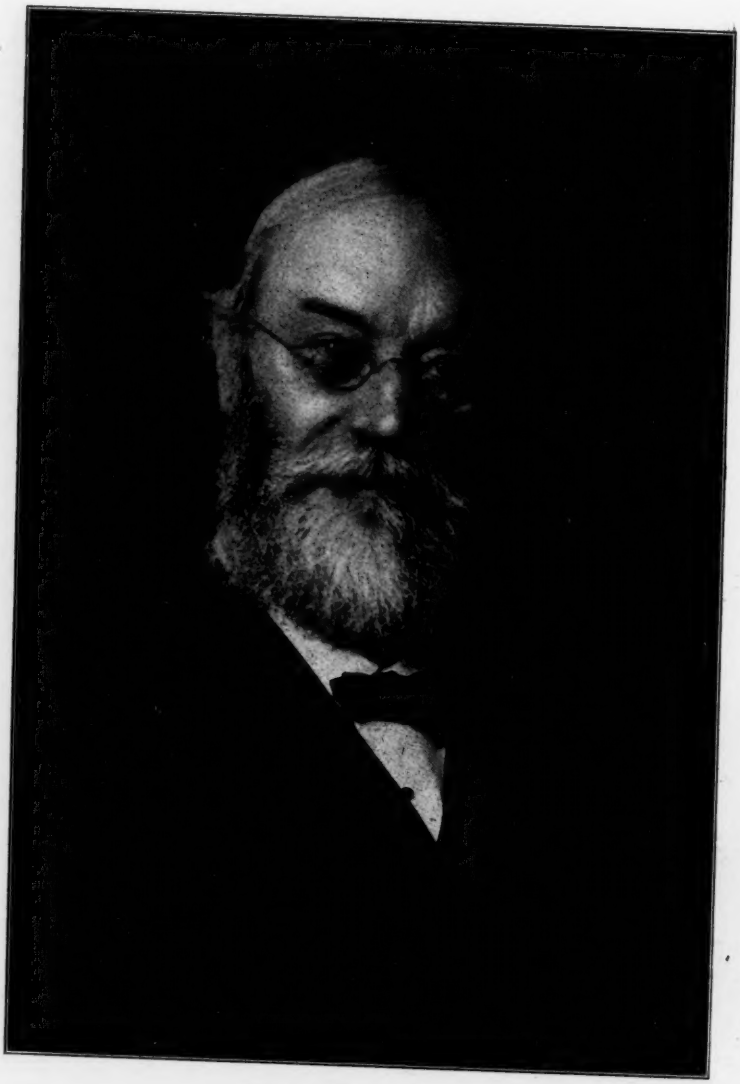
Three fourths of all our scientific men earn their living by teaching, about one tenth in the government service and about one twentieth by applied science. There are only eleven scientific men of standing who may be classed as amateurs, whereas in Great Britain this class is responsible for a considerable part of the research work which is accomplished.

Of our thousand leading scientific men 80 are at Harvard, 48 at Columbia and the same number at Chicago, 38 at Yale, 35 at Cornell, 34 at the Johns Hopkins and 30 at Wisconsin. One half of all the instructors at Clark are among our leading men of science, whereas in certain institutions there is but one in fifty. The institutions which stand the highest are Clark, the Johns Hopkins, Chicago, Stanford, Bryn Mawr, Harvard, Wesleyan, Case and Princeton. These institutions have at least one scientific man of



SIR WILLIAM CROOKES,

the eminent chemist, recently appointed a member of the British Order of Merit.

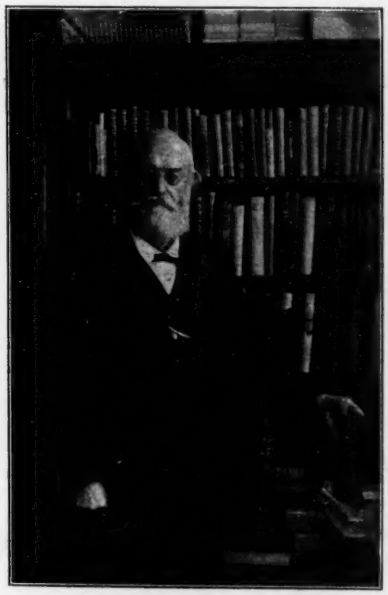


WILLIAM HENRY BREWER.

standing among each ten instructors. The five institutions that have the best record are of comparatively recent establishment; they have given a relatively more prominent position to science than the older institutions and have selected better men. At certain other institutions the ratios are: Yale, 10.6; Michigan, 12.3; Wisconsin, 13.2; Columbia, 13.3; Cornell, 16.5; California, 21.3; Pennsylvania, 25.2.

THE DEATH OF PROFESSOR BREWER

UNTIL the establishment of the Johns Hopkins University in 1876, Harvard and Yale were our chief centers of scientific research and productive scholarship. We are losing one after the other the men who gave distinction to these universities. Yale has mourned the death of Dana, Loomis, Newton, Gibbs, Marsh and Johnson, and now in the death of William Henry Brewer one of the few remaining links with the past is severed. He belonged to a generation and to a type of university professor which scarcely survive. The man of the world is now likely to be found in the university chair as elsewhere, leaving small space for the naïve and the unconventional.



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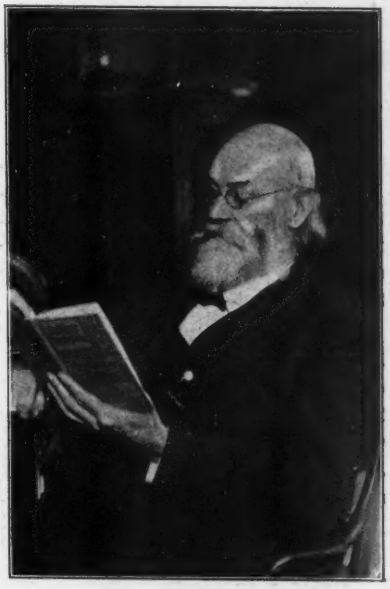

PROFESSOR BREWER IN 1910.

Brewer was born on a farm eighty-two years ago; he graduated with the first class of the Yale scientific school; he studied with Liebig before studying abroad had become usual; in 1858 he became professor of chemistry and geology at Washington College. From 1860 to 1864 Brewer served on the California State Survey and was during the latter part of this period professor of natural science in the University of California. He always looked back with special interest to these years. He was associated with King, Whitney and others in exploring the Sierras, one of whose peaks is named in his honor. At this time the "Botany of California" was prepared.

In 1864 Brewer began his long service as professor of agriculture in the Sheffield Scientific School of Yale University. In addition to the work of his chair, he was indefatigable in investigation and exploration, in lecturing and in attendance at scientific gatherings, being rarely absent even to

the end of his life from the semi-annual meetings of the National Academy of Sciences.

SCIENTIFIC ITEMS

WE record with regret the deaths of David Pearce Penhallow, professor of botany in McGill University, and of Professor Melchior Treub, for twenty-nine years director of the Buitenzorg Botanical Garden in Java.

THE Nobel Prize in medicine for 1910 has been awarded to Dr. Albrecht Kossel, professor of physiology at Heidelberg.—For his researches on the determination of atomic weights the Royal Society has awarded the Davy medal to Dr. Theodore W. Richards, professor of chemistry at Harvard University.—The Harben Lectures of the Royal Institute of Public Health, of London, for 1912, will be given by Dr. Simon Flexner, of the Rockefeller Institute for Medical Research, New York.

ON the occasion of the recent celebration of the Mexican centenary a statue of Friedrich Heinrich Alexander von Humboldt, who more than one hundred years ago made his journey of research through Mexico, was unveiled.—It is proposed to erect in the new chemical building of the University of Michigan a bronze tablet in memory of Dr. Albert B. Prescott, for many years director of the chemical laboratory.—A drinking fountain has been erected at the Central Experiment Farm, Canada, in memory of Dr. James Fletcher, former Dominion entomologist and botanist.—The classification and cataloguing of the Simon Newcomb Library, the acquirement of which by the College of the City of New York has been announced, has been completed. This collection of 4,000 volumes and 6,000 pamphlets, was presented by Mr. John Claflin.

THE hospital of the Rockefeller Institute for Medical Research was opened on October 17. There were no special ceremonies, but a number of guests were present to inspect the hospital. At the same time it was announced that Mr. Rockefeller had given securities valued at $3,820,000 for the endowment of the institute, and that its organization had been completed.—At the celebration of the centenary of the University of Berlin Emperor William made an address, in the course of which he said that the occasion seemed to be peculiarly appropriate for a fresh movement towards the completion of Humboldt's aims. Humboldt's scheme required, in addition to the Academy of Sciences and the University, independent institutions for research. The plan had been communicated only to a small circle, but already sums amounting to between nine and ten millions of Marks, had been forthcoming. It would be the care of his government to see that the new foundations did not lack state assistance.

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THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.

NEW YORK: SUB-STATION 84

SINGLE NUMBER, 30 CENTS YEARLY SUBSCRIPTION, $3.00

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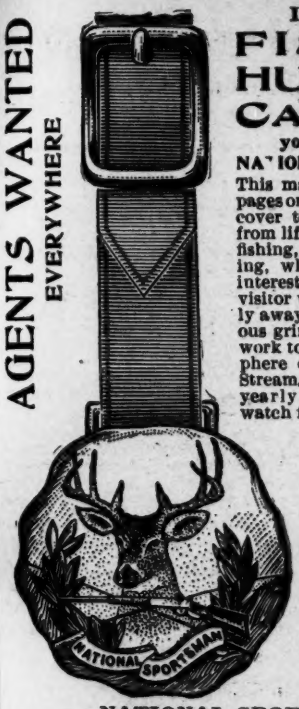

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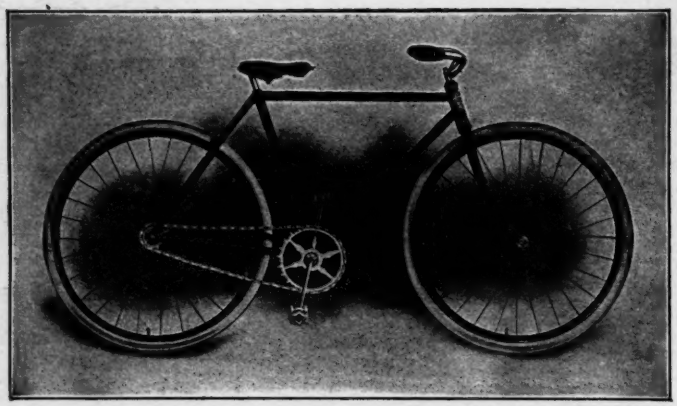

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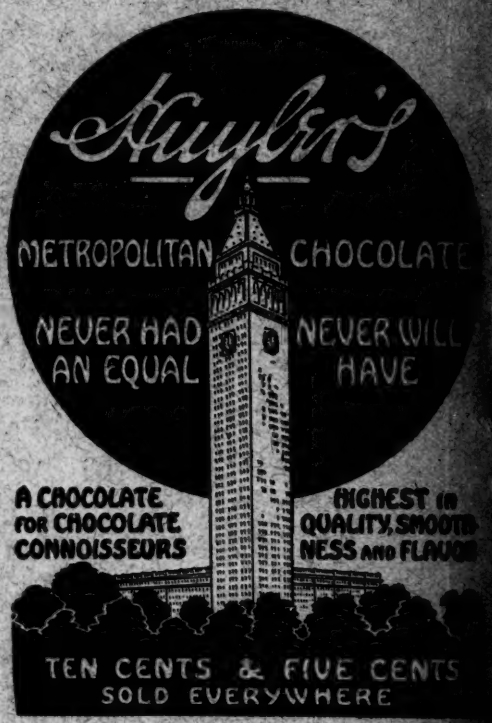

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